

THE USBORNE



# CASSETTE RECORDER BOOK



Special effects



Interviews, plays and music



Wildlife recordings



Lots of fun  
recording  
ideas

Usborne Electronics



# THE USBORNE CASSETTE RECORDER BOOK

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**Edited by Helen Davies**

## Contents

2	Types of cassette recorders	26	A home recording studio
4	Parts of a cassette recorder	28	Recording interviews
6	Cassette tapes	30	Making a programme
8	How to record and play back	32	Recording musical instruments
10	Making simple recordings	34	Mixing recordings
12	Recording from a radio	36	Microphones, leads and plugs
14	Being a disc jockey	38	Fitting plugs and sockets
16	Using a separate microphone	40	A simple mixer to make
18	How to make sound effects	46	Looking after your equipment
21	Making a horror tape	47	Cassette words
22	Wildlife recording	48	Index

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# Types of cassette recorders

This book will show you how to use a simple cassette recorder to make all kinds of recordings, including interviews, music, wildlife and special effects. It will also give you some tips for buying and looking after a recorder, tapes and other equipment.

On these two pages you can see some of the many different types of cassette recorders that are available.

## Pocket-sized recorders ►

These are about the size of a paperback book. Most of them are designed for a particular purpose, such as recording business meetings or dictating letters.

"Personal portables" are pocket-sized stereo recorders sold with a pair of lightweight headphones. They are specially designed to be hooked on to a belt or carried over your shoulder, so you can listen to tapes while you are walking about. You cannot always use them to record.

Recorders are either "mono", which means they have one speaker, or "stereo", which means they have two. Stereo recorders produce better quality sound than mono ones but are more expensive. All the recordings described in this book can be made with a portable mono recorder or a radio cassette recorder.



## Portable mono recorders ▲

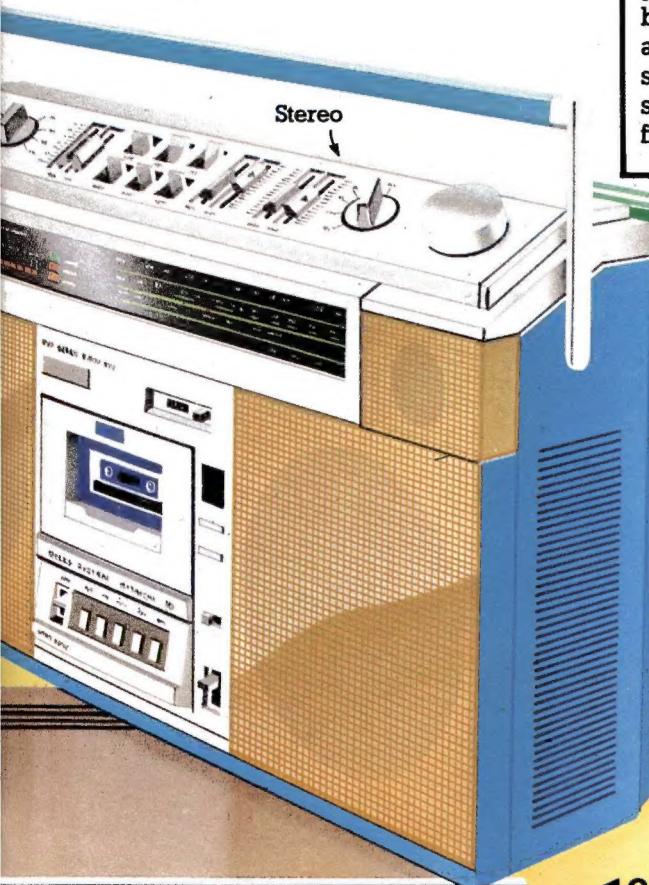
Although these do not produce such good sound as stereo recorders, they are cheap, easy to carry around and suitable for all kinds of recording. Most have a built-in microphone but there is usually a socket for plugging in a separate microphone as well. They usually have a socket for headphones too, and for linking the recorder to a hi-fi system.





## ▼ Radio cassette recorders

These have a radio and a cassette recorder in one case. The recorder may be a simple mono recorder, like the portable mono described below, or it may be a powerful stereo recorder. Stereo radio cassette recorders have a speaker at either end and are often big and heavy to carry around.



## Choosing a recorder

Before you buy a cassette recorder, go to several shops and look at all the makes. Compare prices and check what special features the machines have. (You can find out more about these on the next page.) In general, the cheaper the recorder the poorer the quality of sound, so buy the best you can afford, and test it before you buy it. Take a tape of recorded music and a blank tape (for recording speech) with you to the shop and try out several recorders before you make a final choice.



## ◀ Cassette decks

These are designed to be connected up to a separate amplifier and speakers. They produce very good quality sound and have lots of special features, such as a system for cutting out background noise on tape. However, they only run from mains electricity so cannot be used outdoors or be moved around easily.

Amplifier

Speaker

Cassette deck



# Parts of a cassette recorder

These pictures show a portable mono recorder and radio cassette recorder with the controls and sockets marked to show what they are for. Your recorder may not have all the features shown here and the sockets and controls may have different labels. Check the instruction booklet sold with the recorder to find out exactly what it can do and how it works.

Before buying a recorder, check what sockets it has. Most simple recorders have a built-in microphone but it is very useful to have a socket for a separate or "external" microphone too. Make sure the recorder has a "line input" socket (for recording direct from a radio or record player) and a headphones socket (for listening through headphones or an earpiece).

## **Tone control**

You can use this to adjust the sound when you are playing a tape. You can increase or reduce the volume of the bass notes, which make the sound deeper, or the treble notes, which make the sound higher and more shrill.

## **Volume control**

This alters the loudness of the sound when you play a tape. On most recorders it does not affect the loudness when you are recording.

## **Cassette compartment**

## **Built-in microphone**

## **Rewind**

This winds the tape backwards quickly.

## **Record**

This makes the machine record sounds on tape.

## **Play**

Press this control to listen to a tape. It is sometimes labelled "Forward".

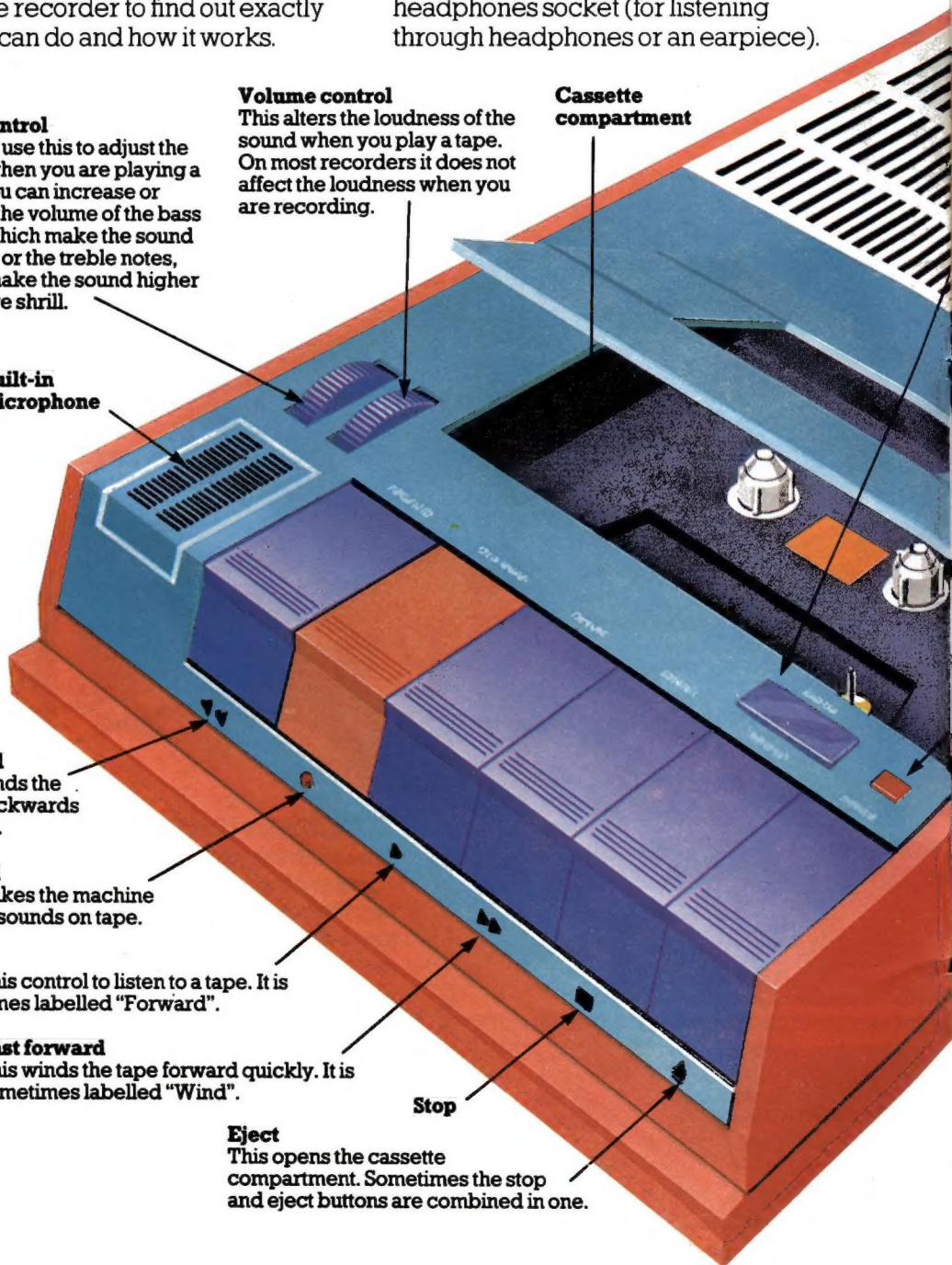
## **Fast forward**

This winds the tape forward quickly. It is sometimes labelled "Wind".

## **Stop**

## **Eject**

This opens the cassette compartment. Sometimes the stop and eject buttons are combined in one.





### Pause

This control allows you to pause for a moment in the middle of a recording. It stops the tape but does not turn the machine off, so you only hear a very faint click, which is barely noticeable when you play the tape back.

### Counter

These numbers move round with the tape so you can note where recordings begin and end. There is a button to set the counter back to zero at the start of a tape.

### Loudspeaker

## Power

Portable recorders run on batteries but most of them also have a mains input socket. It is cheaper to plug the recorder into the mains electricity supply when you can.

### Indicator light

On some recorders this light shows when the machine is recording. On others it indicates that the tape has finished or the batteries have run out. Check the instruction booklet to find out what it shows on your recorder.

### Mains input socket

### Record/playback socket

Some recorders have a large "DIN" socket for recording direct from a radio, record player or second tape recorder.

You can also use it to play back a tape through a hi-fi amplifier and speakers. The socket may be labelled "Rec/PB", "Line in", "Aux in" or "Radio". Recorders with this socket may not have the line input socket shown below.

### Line input socket

Marked "Line in" or "Aux in", this is for recording direct from a radio, record player or second recorder.

### Microphone input socket

This is for plugging in an external microphone. It is usually labelled "Mic".

### Remote socket

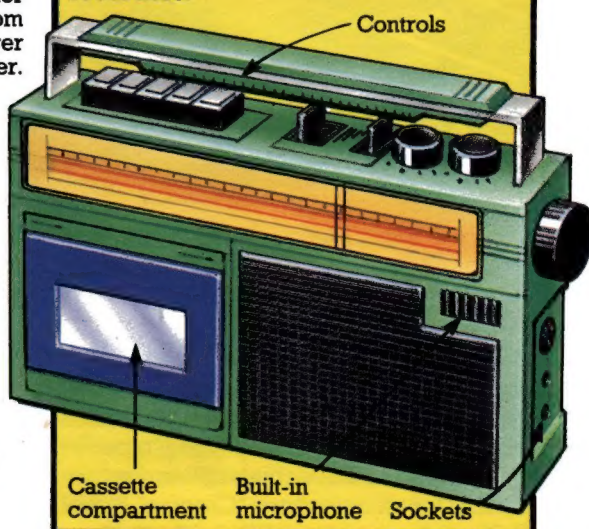
Some microphones have an extra plug which fits this socket (labelled "Rem"). It means you can turn the recorder on and off from a switch on the microphone.

### Headphones socket

You can plug headphones or an earpiece in here to listen to tapes being played or recorded. You can also use the socket to link the recorder to a hi-fi system's speakers.

## Radio cassette recorders

Mono radio cassette recorders like this have the same features as simple mono recorders.





# Cassette tapes

Cassette recorders take their name from their tapes, which are packaged in a plastic case called a cassette. The tape is made from a thin strip of plastic, which is coated on one side with a metallic substance. The recording is made on the coated side.

You can buy either pre-recorded cassettes, with recordings already on the tape, or blank cassettes to record on to yourself. It is best not to buy the cheapest makes of blank cassettes, as these produce poor quality sound and the tape breaks more easily.

Tape is wound round plastic wheels called spools.

Front edge is open so you can see the tape.

Pressure pad holds the tape in position in the recorder.

## Tape lengths

Cassettes can hold various lengths of tape. On blank cassettes the length is shown by a code (C-60, C-90, C-120, for example) printed on the label. The numbers show the total playing time of the tape in minutes. A C-60 cassette plays for 60 minutes.

C-120 tapes have to be very thin to fit into the case. This means they tend to twist or break quite easily. It is best to buy C-90, C-60 or even shorter length tapes.



## Types of tape

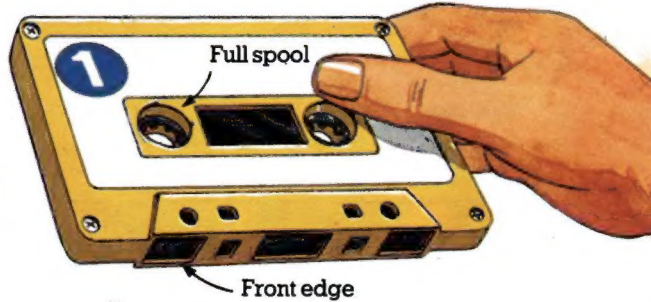
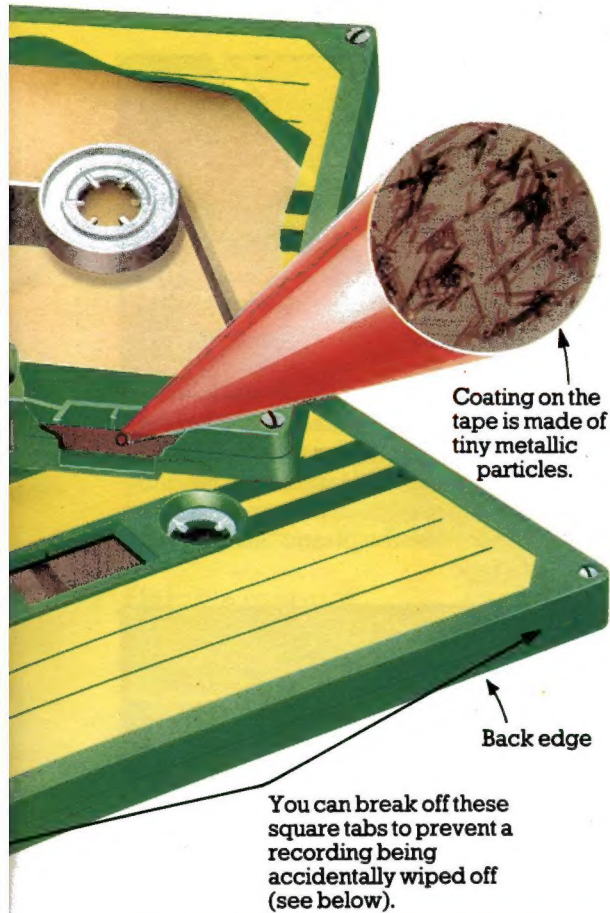
There are various types of recording tape, depending on what metallic substance the coating is made from. The most common and cheapest is "ferric" or "type I" tape. This is often called normal tape and is suitable for all recorders. "Chrome" (type II), "ferrichrome" (type III) and "metal"

(type IV) tapes all produce better quality sound than ferric tape, but you need a special tape selector switch on your recorder to get the best from them. Most simple recorders do not have a tape selector switch, so it is best to buy ferric (or slightly better, superferric) tape.



## Sides and tracks

You can only record on the coated side of recording tape. Cassette tapes are divided into four horizontal tracks and the two upper tracks are recorded and played separately from the lower two. When you put a tape into the recorder for side 1, the two lower tracks are recorded or played. When you put a tape in for side 2, the other two tracks are recorded or played.



On blank cassettes the sides are not always labelled. If not, it is a good idea to mark them yourself to avoid confusion. Hold the cassette with the front edge towards you and the full spool on the left. Then label the side facing upwards side 1 or A.

## How to protect recordings

To make sure a recording does not get wiped off by accident you can remove the tabs on the cassette.

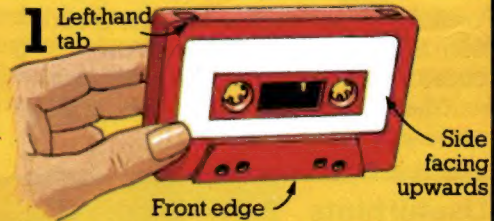
When the tabs are in position, they press against a lever in the recorder which operates the record button. If the tabs are removed, the record button jams, so you cannot make a recording. The tabs on pre-recorded cassettes are always taken out so you cannot use the cassette for other recordings.

2



To remove the tab, lever it out with a nailfile or small screwdriver. Make sure it does not fall back into the hole, or it may get inside the recorder when you play the cassette.

1



There is a tab for each side of the cassette. If you hold the cassette with the front edge towards you, the left-hand tab is for the side which is facing upwards.

3



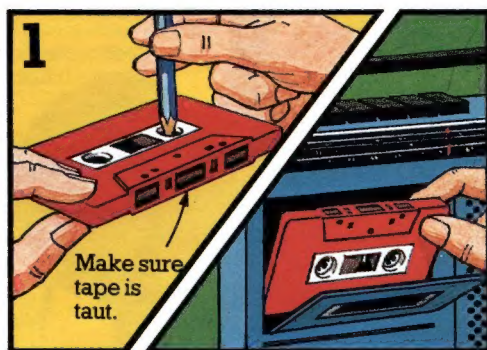
If you take out the wrong tab by mistake or decide you no longer want to keep a recording after all, cover the hole with sticky tape. This will free the record button.



# How to record and play back

These two pages will give you some general hints for recording and playing back with the built-in microphone. The controls on simple recorders are delicate, so don't press one after another in quick succession. Always press Stop and wait for a moment in between.

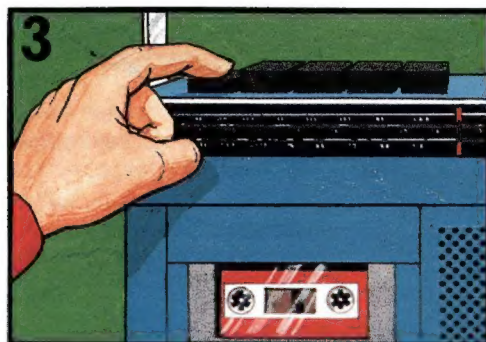
Most simple recorders have an automatic "recording level" control. This means the volume of sound recorded is controlled by the machine and you need not adjust the volume when recording. Some, more expensive recorders have a manual recording level control which you work yourself.



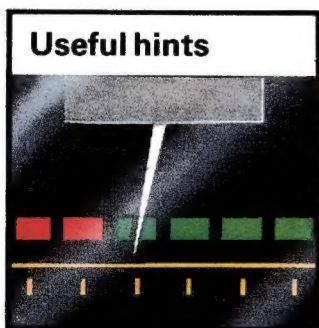
Before inserting a new cassette, wind the empty spool round with a pencil or your finger until the coated tape is visible across the front edge of the cassette. You cannot record on the plastic "leader" at the start of a tape.



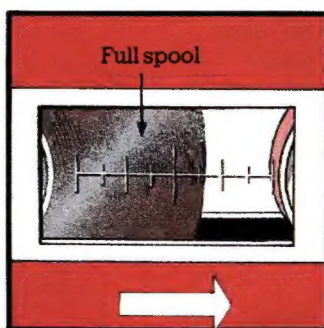
Position yourself so your mouth is about 20cm from the microphone and start recording. On most machines you press both the Record and Play buttons, on some machines just Record.\*



Pause before speaking, so you do not talk over the click of the button being pressed. Speak towards the microphone in a clear, natural voice – not too loud. Pause again before pressing Stop.



Some recorders have a "level indicator" which shows if you are too near or too far from the microphone. (See opposite.)



Before starting to record, make sure that the tape is wound onto the left-hand spool of the cassette.



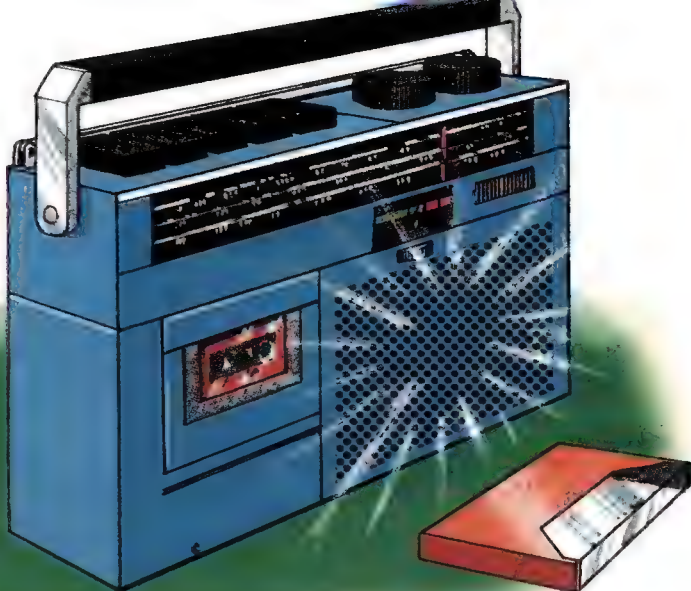
Check that the tabs on the back of the cassette are still in place or you will not be able to make a recording.

\*On most machines, pressing the record button automatically cuts out the speaker. If it does not, turn the volume right down when you record.



## Playing back

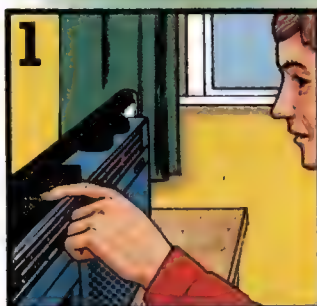
Rewind the tape and play it back, adjusting the volume control to get the sound level you want. If you get hissing or distorted sound (that is, if the words are crackly or indistinct), it means you were too close to the microphone or speaking too loudly. If you can hear the background hum of the tape, you were too far away or speaking too quietly. To work out how to get the best results, make several test recordings, altering the strength of your voice and your distance from the microphone.



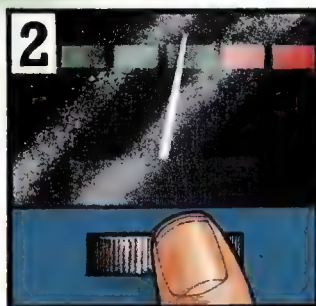
## Using a manual level control

The recording level is the amount of sound or "signal" going on to the tape. If there is too much sound, the recording is distorted. If there is not enough, the recording is drowned by the background hum of the tape.

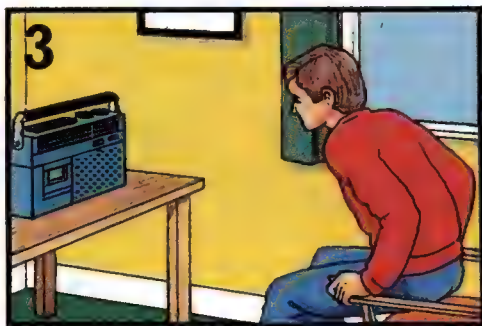
Recorders with a manual recording level control have an indicator to show the amount of sound being recorded and a knob or dial to adjust it.\*



To set the recording level, start the recorder as though you were going to make a recording, then press the pause button so you do not use any tape.



Start speaking and adjust the level control so the needle is in the centre most of the time and only moves into the red during the loudest parts.



If you find you cannot adjust the recording level enough to get a good reading, move nearer to or further from the microphone to alter the volume of the sound.



When you have set the level, release the pause button and start recording. Do not alter the level again. You should be able to set it just once for the whole recording.

\*Some recorders with automatic level control have a level indicator (but no control knob). You can only alter the recording level by moving nearer to or further from the microphone.

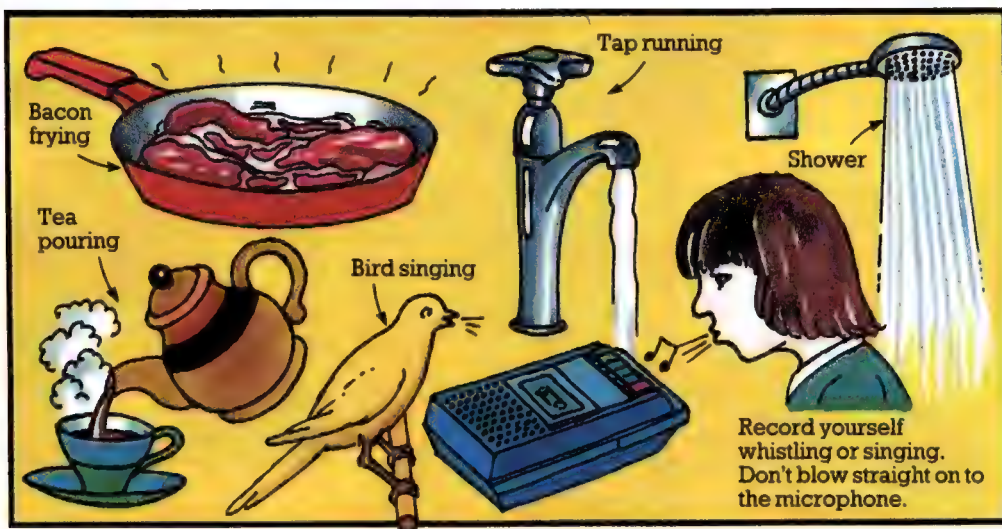


# Making simple recordings

There are lots of interesting sounds to record around the house. The picture below will give you some ideas. To get good results you need a quiet room, away from background noise such as traffic, and without ticking clocks or a telephone. Shut the windows and door, and put a notice outside so people do not come in and interrupt you.

Remember to keep the microphone about 20cm from the sound you are recording and pointing towards it. If the recording is too loud or too faint, move the recorder and try again.

You could try making a tape of a whole day's sounds, starting with an alarm clock ringing and letters falling on to the mat, and ending with someone snoring.



## Sound experiments

Try making two identical recordings of your voice, one in the living room and one in the bathroom. See if the recordings sound different when you play them back.



The recording in the bathroom probably sounds more echoing (or "live") because a bathroom has lots of hard surfaces. When you speak, sound bounces off the walls and other hard surfaces and reaches the microphone a fraction of a second later than the sound going direct to the microphone. This causes an echo which makes the recording less clear.



In a living room there are soft surfaces, such as a carpet, curtains and armchairs. These absorb sound reflected off the walls, so only the sound which goes directly to the microphone is recorded. This makes the recording clearer and more natural. Rooms with sound-absorbing surfaces are described as "dead".

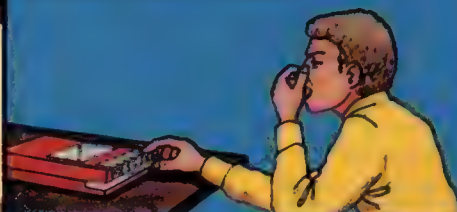




Record some home-made music. You can shake coffee jars, packets and keys, and use a spoon or your hand to play bottles, tins, jars of water, a comb, a waste-bin turned upside down. Try to get as musical a recording as possible.

### Pause button

This control is very useful if you are interrupted during a recording, or suddenly want to sneeze.



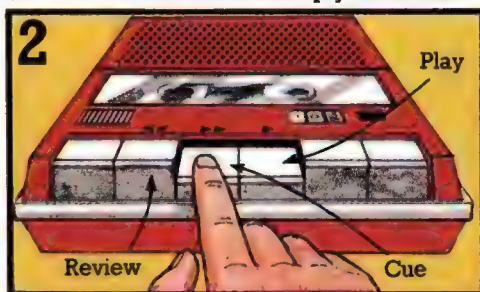
Press Pause to stop recording, then press it again when you are ready to continue. Don't use it for more than a minute or two though, as you will waste batteries and may damage the tape.

## Finding recordings

If you have several recordings on a tape you will want to be able to find them quickly. Most recorders have a "tape counter" or a "cue/review" mechanism to help you do this.



To use the tape counter, set the numbers to zero at the start of a tape. Then note down the number the counter has reached at the beginning of each new recording. Most blank cassettes have a card for noting what recordings are on the tape and where they start. Write in pencil so you can rub out if you want to use the tape again.



A cue/review mechanism enables you to "scan" the tape. You can press Fast Forward or Rewind at the same time as pressing Play. This means you hear the speeded-up tape and can get an idea of where you are from the gaps and changes in the sound. Every so often, release the Fast Forward or Rewind button to find out exactly where you are.

# Recording from a radio

Most cassette recorders have a socket for recording direct from a radio (or record player) without using a microphone. Sound signals coming direct from a radio or other piece of audio equipment are called "line" signals and on many recorders the socket is labelled "Line in". Line signals are stronger than microphone signals, which is why there are usually separate line and mic input sockets. The equipment you are recording from is called the "source".

## Radio cassette recorders

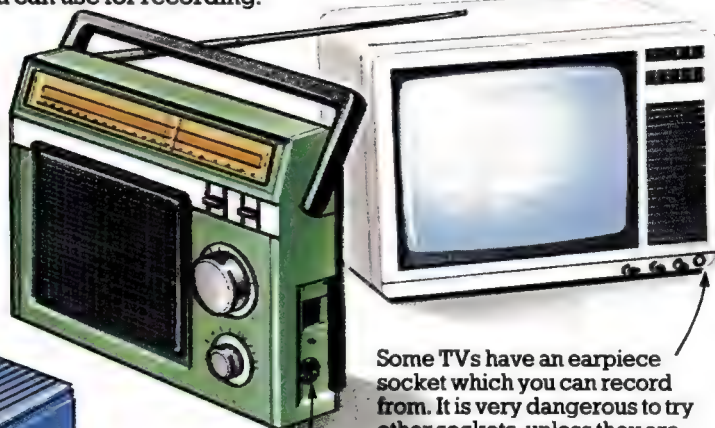
With these you can record from the radio simply by switching the radio on, tuning in to the programme you want and pressing the record button.

## Finding the sockets




The type of socket for connecting radios and recorders varies on different equipment. You may have small 3.5mm "jack" sockets or large "DIN" sockets. \* Only a few makes of television have a socket you can use for recording.



The socket on the recorder is labelled either "Line in", "Aux in", "Radio" or "Rec/PB". If your recorder does not have this socket you can use the microphone socket (marked "Mic") instead, but you may not get such good results.



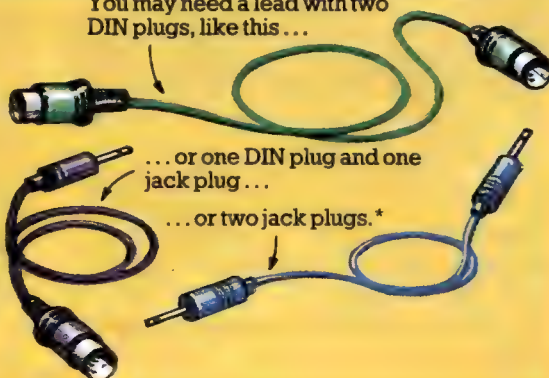
Some TVs have an earpiece socket which you can record from. It is very dangerous to try other sockets, unless they are labelled "Tape" or "Rec/PB".

On the radio look for a socket marked "Tape" (or with this symbol: ) or "Rec/PB". If it does not have either of these, you can use the earpiece socket (usually labelled  or ).

## Buying a lead

You need a lead with the right combination of plugs for your equipment. If you are not sure which plugs to get, take the radio and recorder, or their instruction booklets, to the shop, or make accurate drawings of the sockets. Ask for a "screened" lead. These help prevent interference spoiling the recording.

You may need a lead with two DIN plugs, like this ...



... or one DIN plug and one jack plug ...

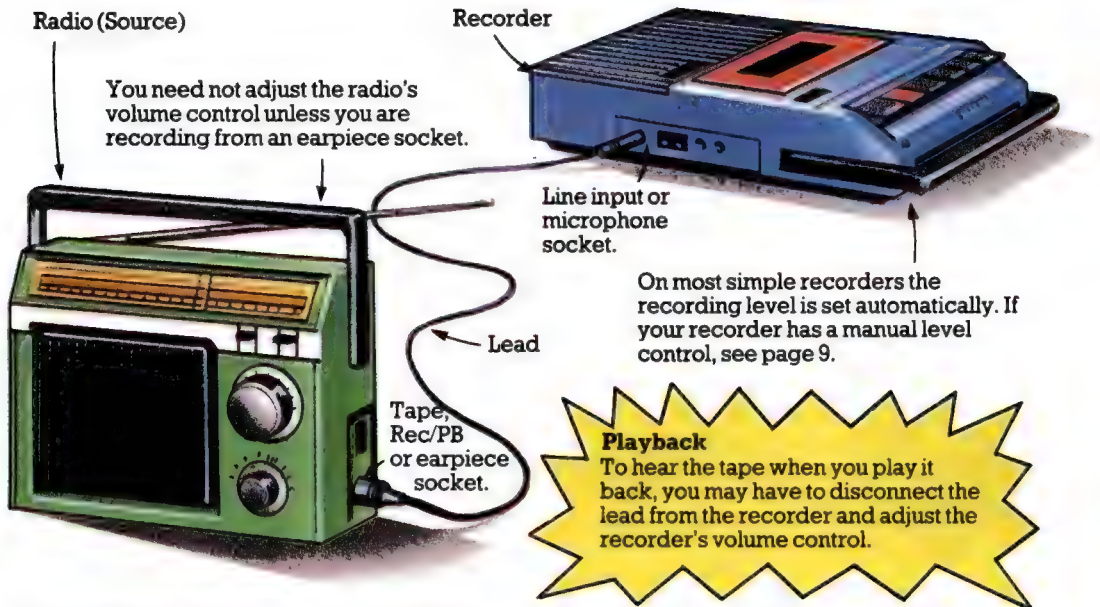
... or two jack plugs. \*

\*For other types of sockets and plugs see page 37.



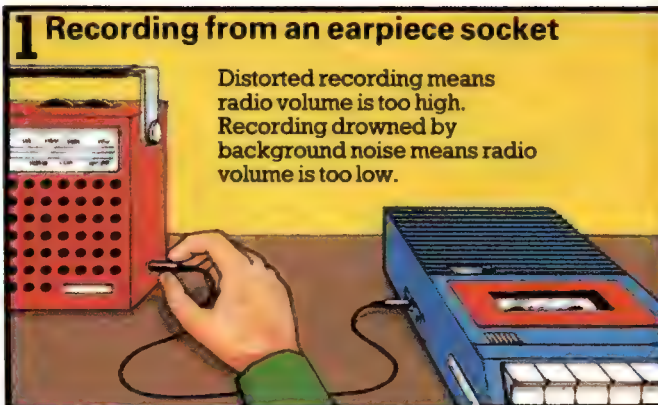
## Making a recording

Below you can see how to set up the equipment to record from a radio. Turn both the radio and recorder off, and unplug them if necessary, before you connect them together. If they are switched on and the radio volume is turned up, you may hear a crack when you plug in the lead. This can damage the recorder's amplifier or speaker.



Connect the equipment together, then turn on the radio and press Record. If you are using a Tape or Rec/PB socket on the radio, you can listen while the recording is being made, and adjusting the radio's volume will not affect the level of sound recorded.

If you are using an earpiece socket, you cannot hear the radio, because the radio's speaker is automatically cut out. In addition, you need to adjust the radio's volume control to get the recording level right. To do this see below.



For this you have to start with the radio on. Turn the volume low and connect up the recorder (this will cut out the sound). Record for a minute. Make several more test recordings with the radio volume higher and lower, noting where the volume control is each time. Then play back the tape. You will probably get the best recording with the volume fairly low.

\*Other machines have a monitor switch which turns on the loudspeaker so you can listen without using headphones.



On some machines you can check the sound being recorded by plugging headphones or an earpiece into the recorder and listening to the recording as it is being made.\*



# Being a disc jockey

If you have a record player (or second tape recorder), you can try being a disc jockey and making a tape of your records, introducing them through the microphone.

On most cassette recorders you can only record from one source at a time, so you have to stop the recording to change from music to voice and back.

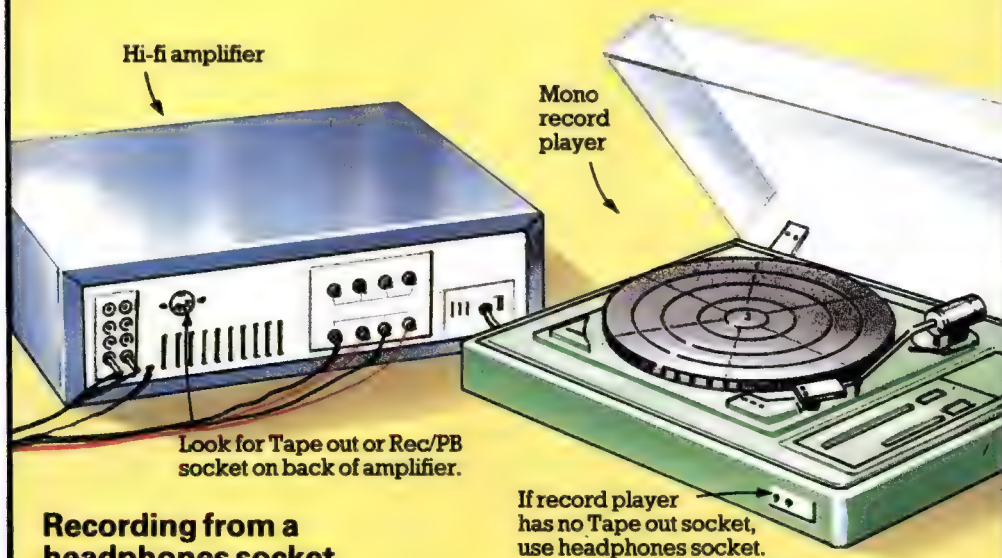
Real disc jockeys have a piece of equipment called a mixer. This enables them to record their voice through a microphone and music direct from a record player in one operation, and mix the two together. You can find out how to make a simple mixer from electronic components on pages 40-45.

## How to tape from a record player

To record direct from a record player, use the Line in or Rec/PB socket on your recorder (see page 5) and find an output socket on the record player marked "Tape out", "Rec out", "Cassette",  $\square$  or "Rec/PB". On hi-fi equipment the output socket is on the amplifier.

If you have a mono record player without an output socket, you can record from the headphones socket.

If you are recording from a proper output socket, the volume of sound going to the recorder is controlled automatically, so you need not adjust the record player's volume.



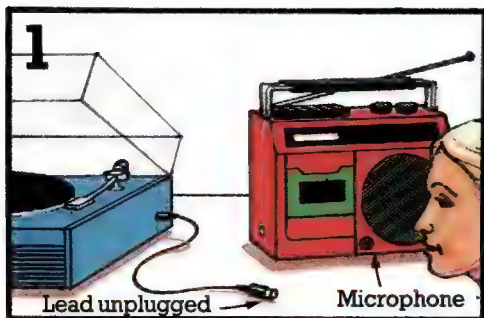
## Recording from a headphones socket

This is the same as recording from an earpiece socket on a radio (see page 13) and you need to adjust the volume of the record player to get the recording level right. The easiest way of doing this is with a pair of headphones. Connect the record player to the recorder, and plug the headphones into the recorder.

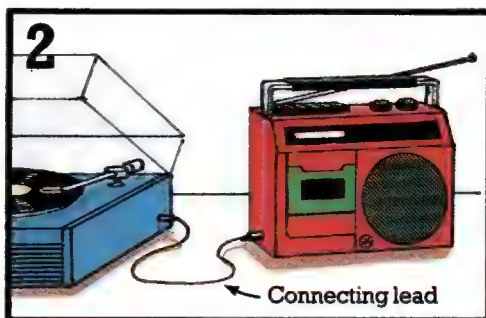
Press Record and Pause (so you do not use any tape), then start the record. Listen through the headphones and adjust the record player's volume until the sound level is right. Then re-start the record and release the pause button to make the recording.



## Mixing speech and music



To record your voice use the built-in microphone or an external microphone (see page 16). If you are using the built-in microphone, pull the connecting lead out of the recorder each time you speak. If you leave it in, your voice will not be recorded.



To record music, plug the connecting lead into the recorder (unplug the external microphone if necessary). Put on the record before the beginning of the track you want and, just before it starts, release the pause button. At the end press Pause again.

## Making the tape

It is a good idea to collect all the records you want to play and put them in order before you start. Try to think of a theme and title for the tape. It could be about the development of rock music or it could be a disco tape.

Note down what you want to say as an introduction, so you do not dry up. Then, set up the equipment, record the introduction through the microphone and put on the first record.



While one record is playing, get the next ready and decide what to say about it. Look for information on the record sleeve and say what you think of the record.

You could include some jingles or an interview on the tape too, if you like. You will find some hints on interviewing technique on pages 28-29.



# Using a separate microphone

Separate or "external" microphones produce much better quality recordings than built-in microphones, which often pick up the noise of the recorder running. They are also useful when you need to be a long way from the source of the sound, for example when you are doing candid recordings or recording wildlife.

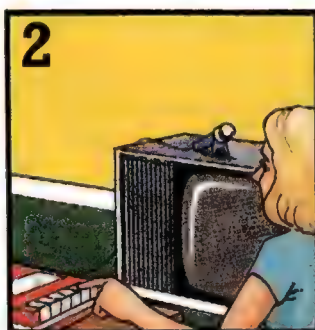
If you are thinking of buying a microphone, you can find out about the different types available, and about plugs and extension leads, on pages 36-37. Below there are some guidelines for using an external microphone.



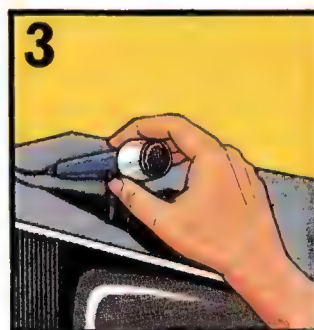
Most microphones have a switch which turns them on and off. Some have a remote control switch which also turns the recorder on and off. When you plug in an external microphone, the built-in microphone is automatically cut out.



**1 Making a recording**  
Plug the microphone into the mic socket and put it on a separate surface from the recorder, so it does not pick up noise and vibration from the recorder.



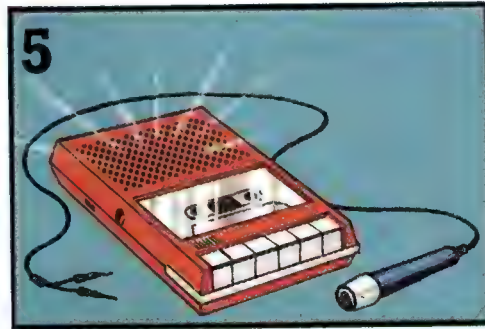
**2**  
Switch on and make a test recording, with your mouth about 20cm from the microphone. Never blow on the microphone to test it, as this can damage it.



**3**  
If you get a hissing sound when you play the tape back, you were too close to the microphone. Keep testing until you find the best distance away.



**4**  
Rewind the tape and start the recording proper. Professionals call this a "take" and test recordings "dry runs". Hold your head slightly to one side of the microphone, so you do not breathe directly at it.



**5**  
Now play the tape back. There should be much less noise interference than with the built-in microphone. Try making some recordings using the extension lead on the microphone, if you have one.

## Candid recordings

You can have lots of fun recording people unawares but be sure you pick people with a sense of humour and tell them afterwards what you have done. You will need a microphone with a long extension lead for doing candid recordings.



Trail extension lead round edge of room so it is hidden.

Hide the microphone close to where the people will be, for instance behind a thin curtain or on a bookshelf. Hide the recorder outside the room. Insert a blank cassette and check everything is working. Turn the recorder on just before your "victims" enter the room or make an excuse to slip out and do it. Try to act and talk naturally. You will arouse suspicion if you dry up or keep looking at the microphone.

## Recording pets



Animals have very sensitive hearing, so put the recorder out of earshot if you can. To record a cat, switch on and quietly rest the microphone nearby. Then try and coax the cat into purring.

## Microphone crackles

Microphone leads and plugs are very sensitive. Moving the lead about or brushing it against things will cause knocks and crackles on the recording. It is best to keep the microphone on its stand but if you really need to hold it in your hand, try holding a loop of lead as well so it does not trail about too much.

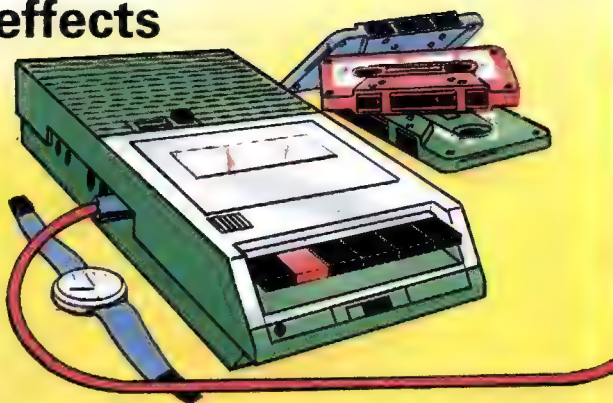




# How to make sound effects

Sound effects are used in many professional recordings, such as radio plays and even news programmes. They are marked "FX" in scripts.

You can buy records of sound effects or sometimes borrow them from libraries, though it is more fun to record your own. There are some hints on making sound effects on the next few pages. If you want to include effects in a programme or play, you can either record them "live", at the moment they are needed, or pre-record them. If you pre-record, you will need a second machine to play the effects tape while you are recording the programme (see pages 34-35).



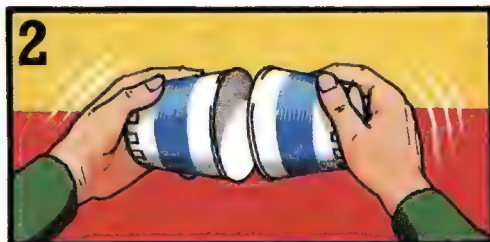
It is best to record sound effects on short tapes so each one is easy to find. Record continuous sounds for at least a minute and interrupted sounds, such as the ring of a doorbell, several times with a few seconds gap in between.

## Making artificial sound effects

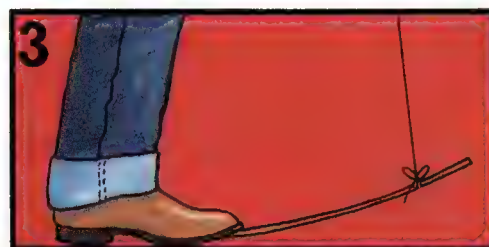
Here are some ideas for making up sound effects. Don't worry if the effects sound slightly unconvincing when you first listen to them. That is probably because you are thinking of the way you made them. If you listen to them a few days later, they should sound much more realistic.



**1** You can make the sound of fire by crinkling cellophane paper very close to the microphone. You can get cellophane paper from food wrappings such as biscuit packets.



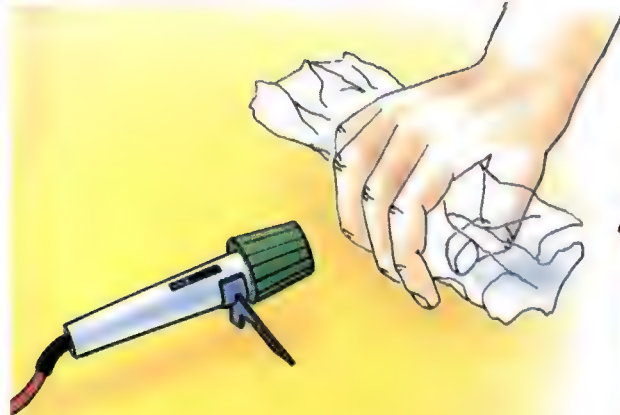
**2** To make the clip-clop of horses' hooves bang two plastic cups or yoghurt pots together. This sounds even more realistic if you bang them down on an old baking tin with gravel in it.



**3** To make a gunshot, use a cane or strip of wood on a hard floor. Tie a piece of string to one end and stand on the other. Pull the cane up a little way with the string, then let it bang down. Another way is to hit a soft cushion with a cane.

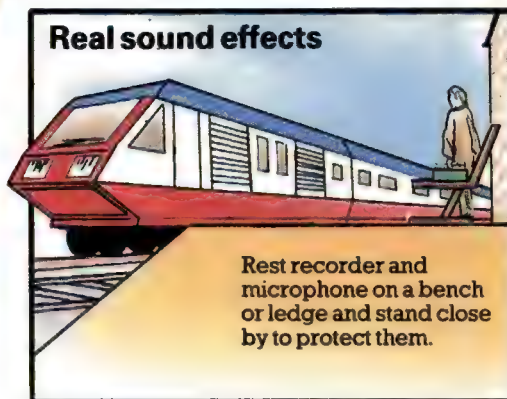


**4** For the sound of a guillotine, chop through a cabbage with a heavy knife. You can make the thud of a body falling by dropping something heavy and soft, such as a rolled-up rug or a sack filled with sand.



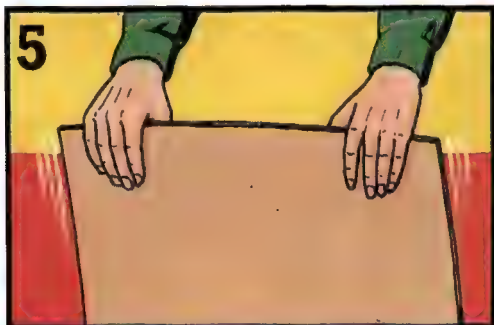
The position of the microphone is important for getting an effect to sound right. It should usually be only about three or four centimetres from the sound, but you will probably need to experiment a little.

## Real sound effects



Rest recorder and microphone on a bench or ledge and stand close by to protect them.

One way to get effects is to record the real thing. Try taking your recorder to a railway station or airport, or to a fairground. For science fiction and space noises, you can record the games machines in amusement arcades.



To make the rumble of thunder, shake a large sheet of cardboard. (Professionals use a sheet of metal called a "thunder sheet".)



For the sound of waves, put a few handfuls of rice or dried peas in a cardboard box and tip it from side to side so they slide about.



You can make the crunch of footsteps on gravel by tapping a metal thimble (or tea strainer) in a bowl of sugar. Or you can walk on a tray of gravel.



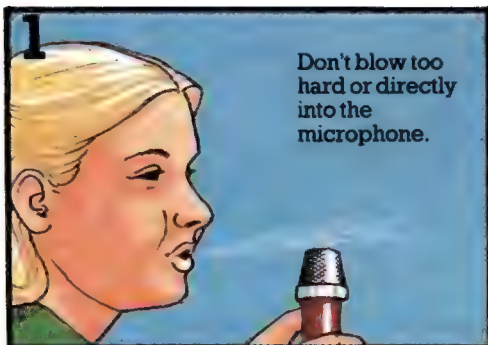
For someone walking through leaves, shuffle your feet in a cardboard box filled with strips of newspaper or, even better, old recording tape.



Record someone climbing a ladder for the sound of footsteps on stairs. For steps echoing on a stone floor, record someone walking on a pavement.

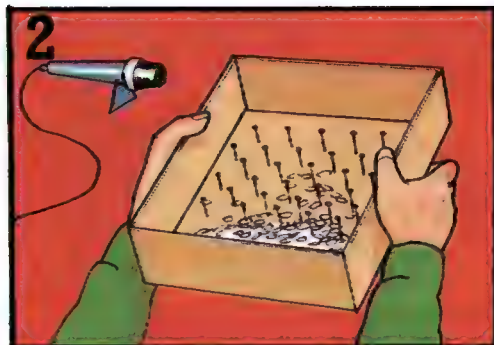


## More sound effects



Don't blow too hard or directly into the microphone.

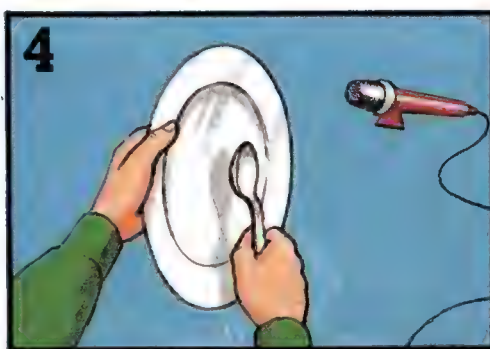
Blowing across the top of a microphone sounds like a howling wind on tape. See if you can make the wind rise and fall, or whistle round corners. A few people blowing at once can make a storm.



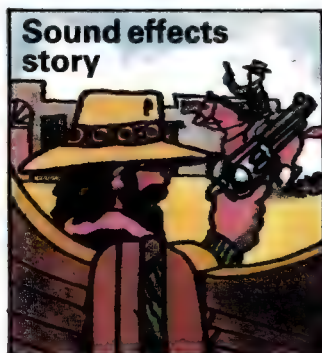
To make the sound of driving rain, stick pins up through the bottom of a long thin cardboard box. Then put in a couple of handfuls of rice and tip the box backwards and forwards.



For a creaking door, twist a balloon between your hands or rub a damp cloth up and down a taut rubber band. For doors slamming, and keys or handles turning, record the real thing.



Hitting a metal plate or a piece of metal pipe with a spoon makes the sound of a church bell or clock chime. You will get the best effect if you position the microphone a few metres away.

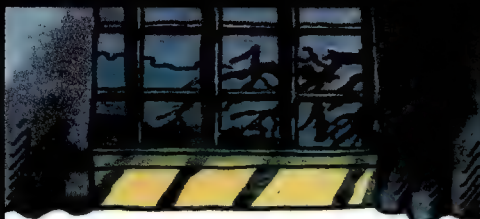


### Sound effects story

You can tell a story using nothing but sounds. If you record three or four sounds in different orders, each sequence will tell a different story. The pictures above will give you some ideas for stories you could make by rearranging the sounds of a gunshot, horses' hooves and a door banging.

# Making a horror tape

Here is an idea for a bloodcurdling horror tape using some of the sound effects from previous pages. You will probably need someone to help you, and to produce screams and owl hoots. Get together all the equipment you need before you start and have several trial runs to get the timing right. Use the pause button when you need to. For the most frightening effect, play the tape in a darkened room.



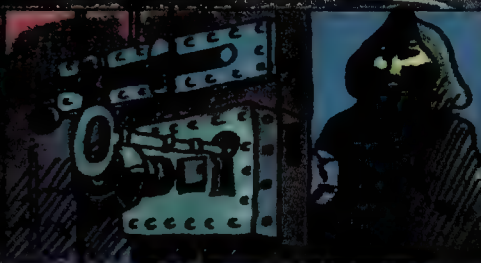
There is a gentle breeze (blow across the microphone) and twigs scrape against a window pane. The wind gradually rises to become a howling gale and rain beats down (rice in a cardboard box with pins in).



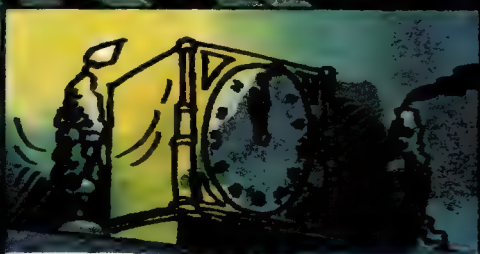
The wind drops and an owl hoots. There is the sound of horses' hooves (yoghurt pots or plastic cups), at first in the distance but getting closer and closer. The horse stops.



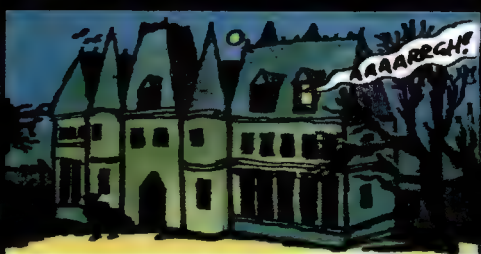
Someone jumps off the horse with a thud (drop something heavy and soft) and walks up a gravel path (thimble or tea strainer in a sugar bowl).



A bolt rattles and a key turns in a lock. (Record the real thing.) A door creaks slowly open and then shut again (hands on a balloon).



Footsteps die away down a passage. (Record someone walking along a pavement.) A clock chimes thirteen (metal plate and spoon) and leaves rustle in the wind (box of newspaper).



Suddenly there is a scream and the sound of footsteps running in the distance. A terrible cry is heard, followed by a thud (drop something heavy and soft again), then silence.



# Wildlife recording

You do not need to be in the country to record wildlife. You can record birdsong and the sounds of insects, frogs and other small animals in a garden or your local park. Notice the habits of birds and animals so you know which is the best time and position for making a recording.

In built-up areas, traffic noise will spoil recordings during the day, so the best times to record are early in the morning and in the evening. Try to get up very early one morning and record the dawn chorus. If you go out to record, it is best to take a friend with you.

## 1 Useful equipment

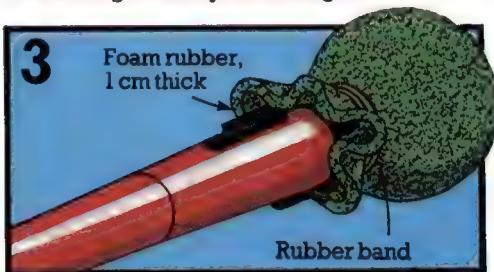


Directional microphone

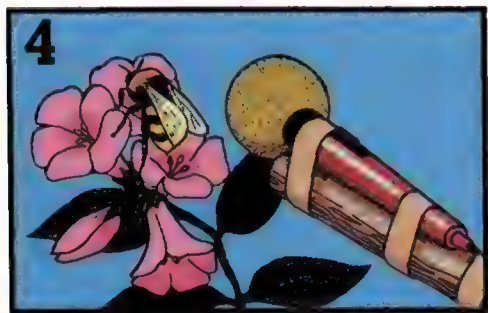
Directional microphones (ones which pick up sounds mainly from the front, see page 36) are best for wildlife recording as they cut down background noises. An extension lead is very useful, and headphones for listening to the recordings as they are being made.



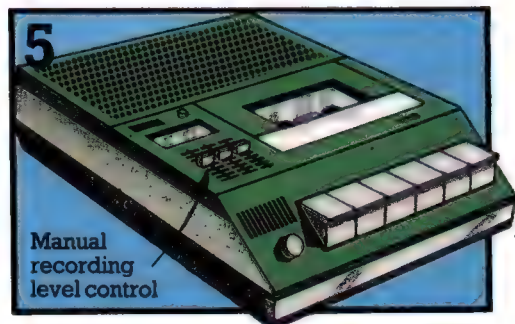
The wind is a problem with all outdoor recording. Even a gentle breeze blowing across the microphone sounds like thunder on the tape. Professionals use a foam rubber cap, called a windshield, to cut out wind noises. You can buy these from some hi-fi shops, or make one as shown on the right.



You need a piece of foam rubber or sponge about 1cm thick and large enough to wrap round the head of the microphone. You can buy foam rubber from upholstery shops. Fasten it in position with a rubber band and check it does not muffle the sound completely. An alternative is to use a piece of silk.



If you hold the microphone, it will pick up handling noises, so tape it to a stick. This will also enable you to reach closer to animals without disturbing them. Tape the lead to the stick, so it does not flop about.




If you are really keen, it may be worth buying a portable recorder with a manual recording level control. Then you can adjust the recording level to suit the loudness or softness of sounds you record.




## Recording birdsong


Note where and at what time the birds usually sing. A few hours beforehand, put the microphone close to the spot and go right away so they do not become suspicious. Later, slip back quietly and, when the birds come close, switch on. If you have headphones or an earpiece, you can listen in to the recording. Remember though, you can only alter the recording level if you have a manual control. Below are some ideas for places to put the microphone.




Fastening the microphone firmly to a branch is a good way to record young birds in a nest. Be very careful you do not disturb the nest or the parents may desert it.



You can tape the microphone to a post or broom handle pushed into the ground near a bird's perch.

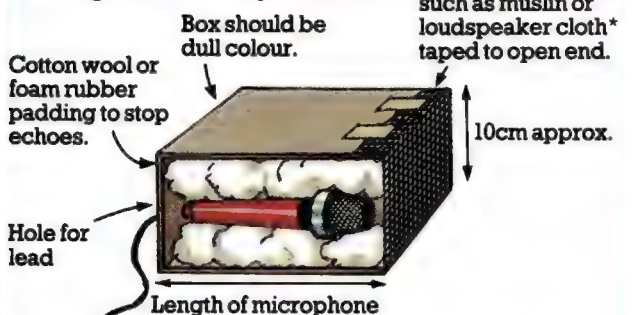


If you are surrounded by countryside or have trees near your house, you can make recordings just by putting the microphone on the ledge of an open window.



A bird table is ideal for making recordings. Tape the microphone under the roof or to the edge of the table. See how many species you can recognize when you play the recording.

### Hiding the microphone



If you think the microphone is frightening the birds away, try making a box to conceal it. Keep putting it in the same place so the birds get used to it. Don't leave it out in wet weather.

### Using an umbrella



An umbrella is useful for recording birdsong from a distance. On the next page you can find out how to set up the umbrella and microphone.



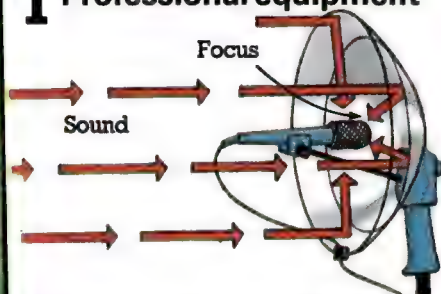
## Making an umbrella reflector

Professionals use a kind of dish, called a parabolic reflector, to record sounds they cannot get close to, such as a bird singing high up in a tree. When sound hits the dish, it is reflected on to a microphone and becomes concentrated. You can make a reflector from an open umbrella. It is best to use a dull coloured one, so it does not attract the birds' attention. Tape the microphone about 15cm down the stem, pointing into the umbrella.

Move microphone up and down stem to find focus.

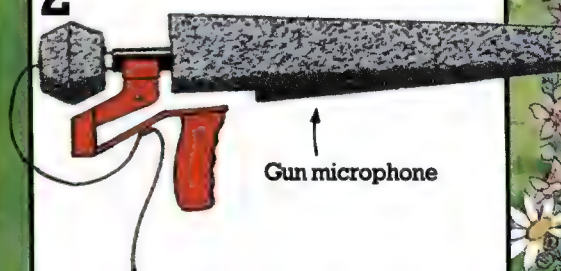
To get the best results you need to adjust the position of the microphone until you find the exact point at which the reflected sound is concentrated (called the focus). You can do this by using headphones or an earpiece. Set the machine to record, then press Pause and listen in through the headphones. Move the microphone up and down the stem until you find the point where the sound is clearest. Then tape it in position and release the pause button to start recording.

### 1 Professional equipment



This picture shows a professional parabolic reflector. The arrows show how sound is reflected on to the microphone, which is positioned at the focus of the reflector.

### 2



Professionals also use "rifle" or "gun" microphones to pick out one particular bird or animal call from a distance. These microphones are very sensitive to sound in one narrow beam.

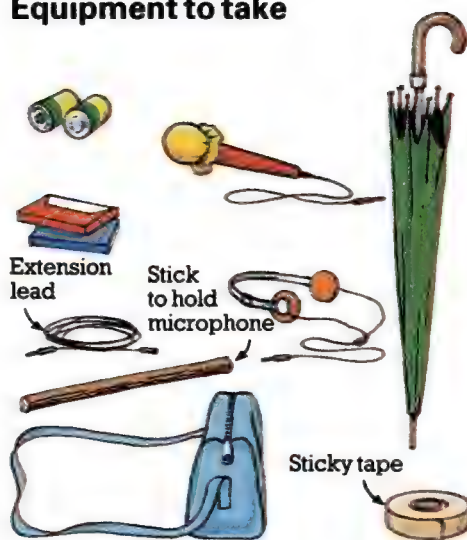


## More recording ideas

There are lots of opportunities for recording wildlife if you go walking or fishing, or on holiday. For recording expeditions a shoulder bag is very useful to carry your recorder and equipment, as well as maps, rainwear and food, and it leaves your hands free to operate the recorder.

Birds and animals in the wild are not used to people and are extremely shy. An umbrella reflector will help you to get good recordings without having to go too close and frighten the animals or birds away. Remember to take tapes and some spare batteries with you.

## Equipment to take

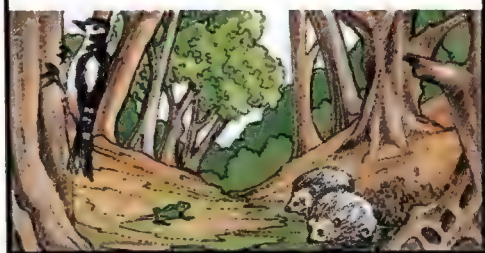


### Fields and flower-beds



Fields with long grass, hedgerows and flower-beds are good places for recording insects, such as bees gathering pollen. You could plant the microphone on a stick and leave it, then see how many of the recorded sounds you can recognize.

### Woodlands



There are lots of sounds to record in woods. If you are lucky, you may hear unusual birds, such as cuckoos, though you will rarely see them. Listen for frogs croaking near water, especially during spring and early summer.

### Night-time sounds



At night you may be able to get recordings of foxes barking, frogs croaking near water, owls hooting and even bats, which make a clicking noise. Try putting out a saucer of milk and see if it attracts animals.

### Zoos and wildlife parks



You can record unusual animals or birds at zoos, wildlife parks and bird sanctuaries. Most caged animals are used to people so you can put the microphone fairly near the railings. Be careful the animal does not grab it though.



# A home recording studio

In everyday life you do not usually notice sound reverberating off walls but on recordings the echoes show up. To make recordings sound natural, professional studios are lined with sound-deadening material.

Here you can see how to improvise a studio at home using three

cardboard boxes and some cloths, such as blankets, old curtains or coats. A studio like this is very useful if you are recording in a room which has a lot of echo.

Try out the studio by recording a story in it. There are some tips for doing this below.

Boxes, about 60cm high, arranged in U-shape with open side of U towards you.

Cloths draped over boxes.

Table covered with thick cloth.

Make some test recordings in the studio, remembering to keep your mouth about 20cm from the microphone. The recording should sound more natural than one made outside. If the sound is muffled or flat, it means there is too much deadening. Try moving the boxes further apart or bringing the microphone forward. Keep adjusting the studio until you get a really natural recording.

Recorder outside studio

## 1 Recording a story



If the book you are reading from is your own, bend the corners of the pages up, so you can turn over quickly and silently.

## 2



Pencil in the first few words of each page at the foot of the previous page, so you do not pause when you turn over.

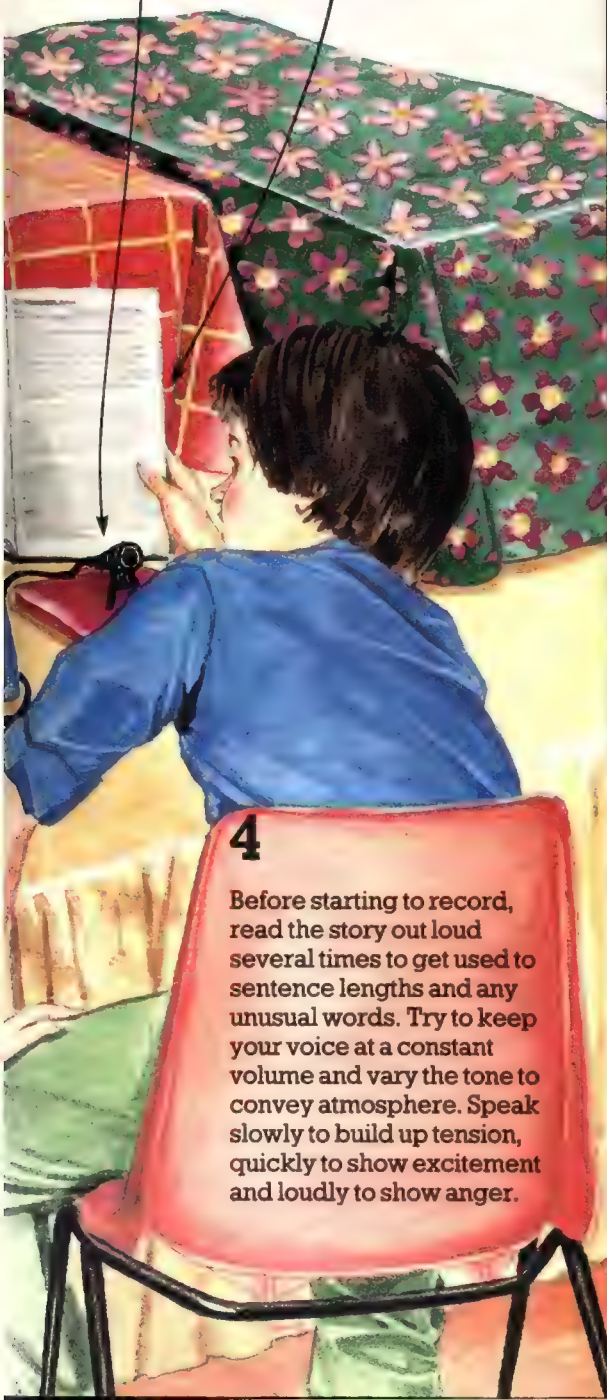
## 3



Hold the book up like this so you speak into the microphone and do not let your head drop as you read down the page.

Microphone on cushion to stop it picking up recorder vibrations through table.

Microphone positioned so you lean into studio to speak.



## A larger studio



If you need a fairly large studio, to record someone playing a musical instrument for example, you can arrange three chairs as shown above and drape cloths over them.

4

Before starting to record, read the story out loud several times to get used to sentence lengths and any unusual words. Try to keep your voice at a constant volume and vary the tone to convey atmosphere. Speak slowly to build up tension, quickly to show excitement and loudly to show anger.

5



If the story has several characters, try to use a different voice for each one. Practise switching from one voice or accent to another without hesitating.

You can make a voice sound distant by turning your head away from the microphone slightly (this is described as being "off microphone") and putting your hand in front of your mouth.



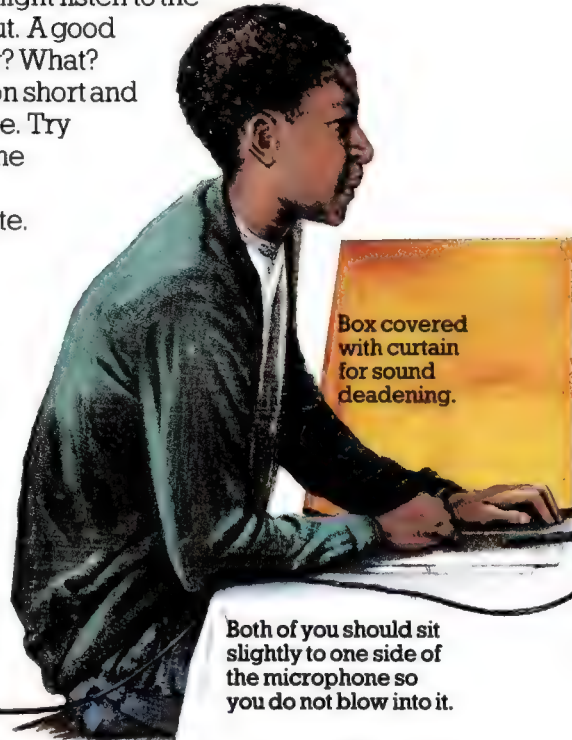
# Recording interviews

For a successful interview you need something interesting to talk about, for instance something unusual a friend has done. Note down what you want to ask, bearing in mind who might listen to the interview and what they would like to find out. A good guideline is to ask questions beginning How? What? Where? When? Why? Make the first question short and easy to answer to give the person confidence. Try to sound as though you really want to know the answer.

Position the microphone as shown opposite. Make a test recording to check both of you are the right distance away from the microphone and are speaking towards it. If the person you are interviewing is nervous, chat to them to make them feel at ease.



Rewind the tape and start recording. First, introduce the person and say what you are going to talk about. Then repeat the person's name and ask the first question. Remember to make it short and easy to answer.



Box covered with curtain for sound deadening.

Both of you should sit slightly to one side of the microphone so you do not blow into it.

Do not stick rigidly to a prepared list of questions. Listen to the answers and try to ask questions which follow on from them, but bear in mind what you want to find out from the interview and try to direct the questions accordingly.

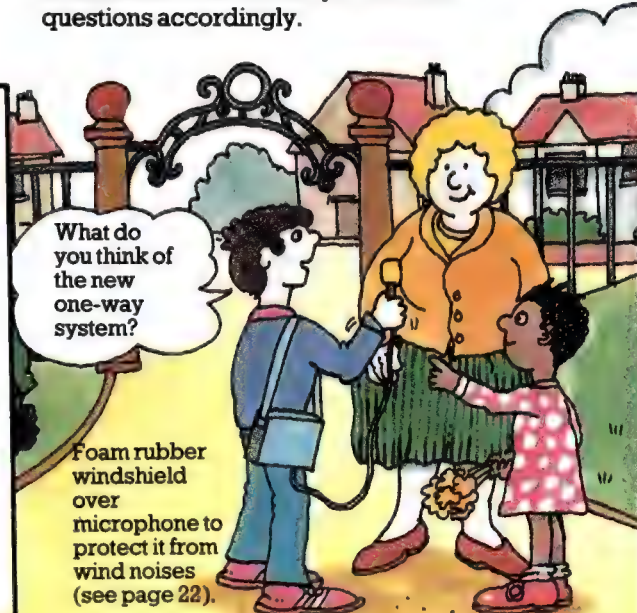
## Interviewing outside

You can have lots of fun interviewing people in the street. Try to find a place where people pass frequently but which is fairly quiet and not windy. Some background noise adds atmosphere but too much drowns people's voices. A park is often a good place. Don't try to interview in a busy street where you might cause an obstruction. You can carry the recorder over your shoulder or put it on a seat or ledge beside you.

Think of a topical question and record people's reactions to it. Remember to be polite and if people refuse to answer, don't persist.

What do you think of the new one-way system?

Foam rubber windshield over microphone to protect it from wind noises (see page 22).



If you make a mistake you can stop, rewind the tape and re-record the part that went wrong. However, some mistakes are funny and worth keeping on tape.



Microphone taped to side of jar.

If the person dries up, help them out by making a comment or asking another question, or press Pause to stop the recording for a moment. Finish by thanking the person and saying how interesting it was to talk to them.



Which record is number one?

Do you know the latest cricket score?

Buy or make a shoulder strap for recorder.

## Positioning the microphone



Directional microphone

If you have a directional microphone (one that picks up sound mainly from the front), you should both sit on the same side of the table and position the microphone in front of you, so you can quietly lean forward in turn to speak into it.



Omni-directional microphone

If the microphone is omni-directional (picks up sound from all round), you can stand it upright in the centre of the table and sit at opposite sides of it. This is the best type to use for interviewing groups, where several people need to sit round one microphone. \*

A directional microphone is best for recording outside. \* Point it at whoever is speaking, remembering to keep the lead as still as possible. If you have an omni-directional microphone, hold it upright between you.

While you are waiting for people to come along, stop the recorder so you do not waste tape or batteries. You need not record yourself repeating the same question. When you have recorded it once, just switch on to record the answers. Ask the person to let the tape run for a few seconds before speaking or you may miss the first few words. Take plenty of tape and some spare batteries with you.



\* You can find out more about microphones on page 36.

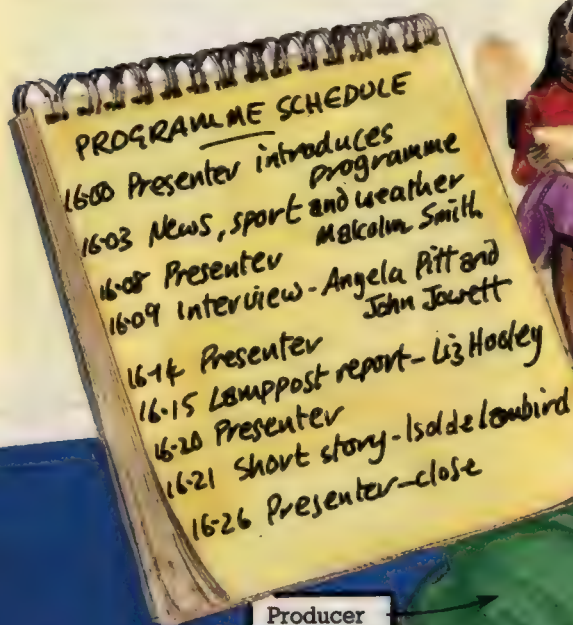


# Making a programme

Here are some hints on how to put together and record a programme. First, imagine who the programme is for and think of a title. You could do a programme with interviews, special features, news and weather reports, sports results and a short story.

You need someone to be a producer, one or two presenters, a

newsreader and several people doing different items. Below you can find out what each person should do and how to plan, direct and rehearse the programme before recording it. It is a good idea to make a tall microphone stand so people can stand up and slip quietly to and from the microphone.



## Being the producer

The producer directs the programme and operates the recorder. Work out who is going to do what, then make a programme schedule showing the order of the items and how long each one takes. Plan a programme lasting just under 30 or 45 minutes so it will fit on to one side of a

cassette. Give each person a copy of the schedule or pin it up.

The producer can listen to the recording through headphones, and should time everything with a watch, giving hand signals or "cues" to tell people when to speak.

## Giving cues

10 seconds before start ...

5 seconds ...

3 seconds ...

Cue to start

5 minutes ...

Cut



Ten seconds before the start, hold up both hands. Lower one hand after five seconds and press the record button.



Count down the last five seconds with your fingers and give the cue to start by pointing at the person who is to speak.



As the time for each item runs out, give a five minute, then a one minute, warning, then give the signal to stop.



... and Steve Bird.

Hello! This is Radio Usborne, with this week's edition of "City Life", introduced by Elaine Williams ...

Today we have an interview with a bus driver and a report on a disappearing lamppost but first here is the news ...

## Being a presenter

A presenter's job is to introduce the programme. Give your name, say what is going to be on the programme and announce the first item. For variety, have two presenters speaking in turn.

... and now the mystery of the disappearing lamppost from Liz Hooley.

The presenter also links items together, thanking the last person to speak and introducing the next.

That's it for today. Thanks to Malcolm Smith, John Jowett, Liz Hooley, Angela Pitt ... Coming up next week is a report on discos and dance halls.

"Till then, it's goodbye from Steve Bird and Elaine Williams.

Newsreader

Make mike stand by fixing broom handle in bucket of soil.

Presenters

## Being a newsreader

For news reports you can use the opening paragraphs of newspaper articles, altering the wording so they read easily. Practise pacing your reading to take the exact time allowed. Professional newsreaders have a separate sheet for each item with the "time out" (the number of seconds they have to read it) written on the bottom.

At the end, the presenter should thank all those who took part, listing their names, and say what will be on the next programme.

## Rehearsals

Everyone should rehearse their part of the programme two or three times on their own, timing themselves with a watch and cutting or lengthening the piece to fit the allotted time. If an item is much too long or too short, you may need to alter the schedule to allow for it.

Finally, all get together for a recorded rehearsal. This is to check

that everyone is positioning themselves correctly and knows when to come in, and to set the recording level if necessary. At the rehearsal the presenter should do the introduction and links but everyone else needs only say the first and last lines of their piece. When you have sorted out any problems, rewind the tape and start the recording proper (the "take").



# Recording musical instruments

Musical sounds are more complex than speech and it is difficult to get good recordings of instruments. The hints on these pages will help but do not be disappointed if the recordings do not sound quite like the original.

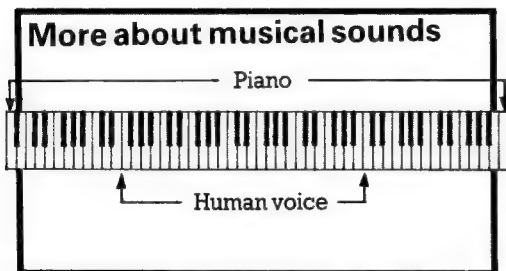
The sound will be affected by the size and shape of the room, so experiment with the microphone in different positions and with the windows open and shut. If the recording echoes draw the curtains or hang blankets over some of the hard surfaces.

## Recording single instruments



For woodwind instruments, such as the recorder or clarinet, and brass instruments, such as the saxophone, put the microphone about 20cm from the end and slightly to one side so air is not blown directly on to it.

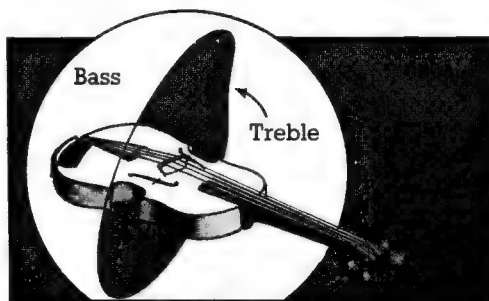
Stringed instruments which are plucked, and percussion instruments which are hit, are more difficult to record. For instance, when you play a guitar the noise of your hand hitting the strings sounds louder to the microphone than the musical note which follows and this can distort the recording. For these instruments, start with the microphone 30-40cm away and make tests, moving the microphone further away if the recording sounds distorted. If you have a manual control set the recording level lower than usual.



Musical instruments are capable of producing a much wider range of sounds than the human voice. The maximum range of the human voice is three and a half octaves, and you only use one octave when you are speaking. A piano has over seven octaves.

A directional microphone is best for recording a single instrument or a large group, such as an orchestra, because it helps to cut out background noise. For small groups or an accompanied singer, an omnidirectional microphone is best.

If you are recording a group of instruments you need to balance them so they are all clearly recorded. Position the microphone closer to the instruments which produce soft sounds, so they are not drowned by the loud ones.

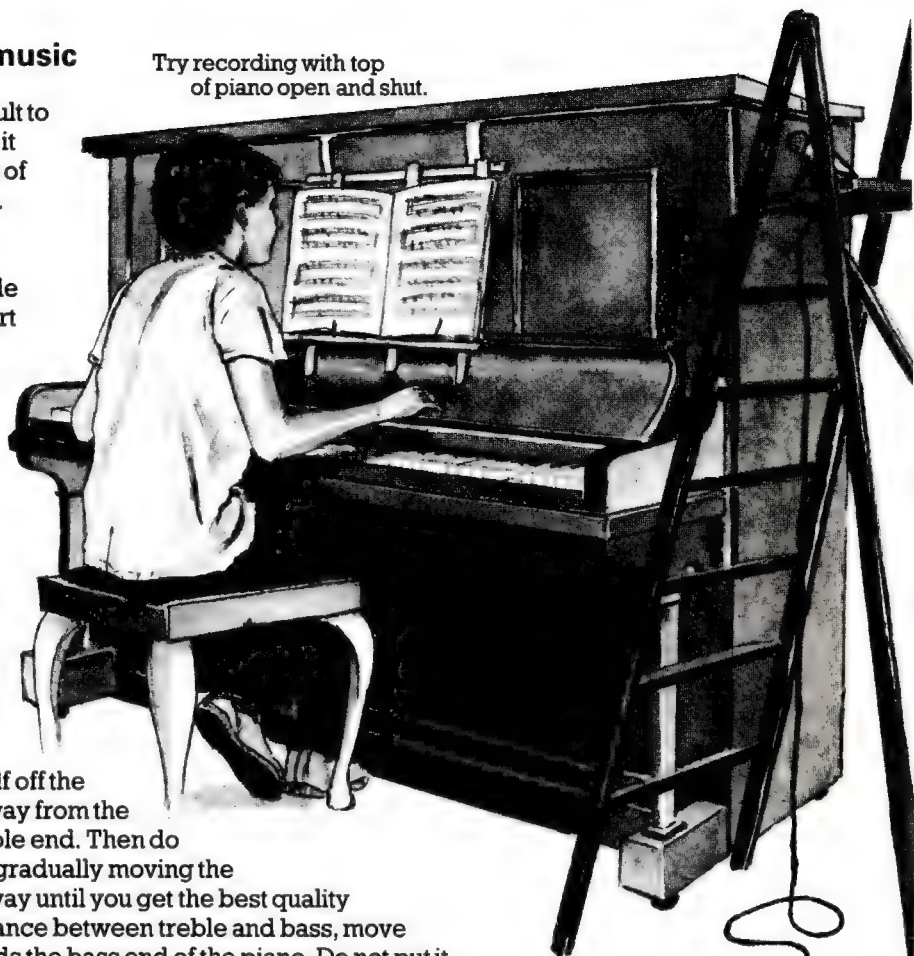


Low or bass notes travel out in all directions, but high or treble notes move in a fairly narrow band. They are said to be more directional. When you record a group of different kinds of instruments, put the microphone nearer to the treble instruments.

## Recording piano music

The piano is very difficult to record, partly because it produces a wide range of notes from a large area. Also, the sound of the hammers knocking against the strings inside the piano tends to distort the recording and give it a "rattling" sound. To deaden the sound, draw the curtains and hang blankets around the room.

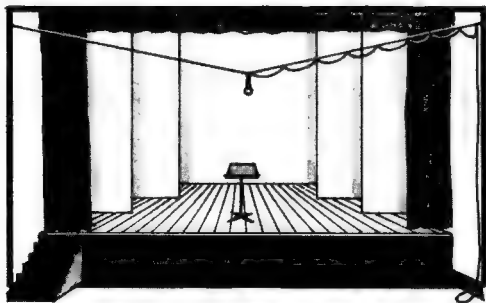
Try recording with top of piano open and shut.



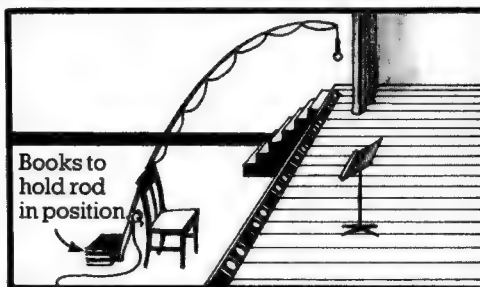
Put the microphone about a metre and a half off the ground and a metre away from the piano, towards the treble end. Then do some test recordings, gradually moving the microphone further away until you get the best quality sound. To alter the balance between treble and bass, move the microphone towards the bass end of the piano. Do not put it on top of the piano or you will pick up the thuds of the hammers inside.

## Orchestras and choirs

If you want to record a concert ask permission from the organizers beforehand (it is illegal to record without permission). If possible, position the microphone about three metres above the conductor's head and two or three metres behind it to get a good overall sound. Point the microphone towards the section where the treble sounds are.



You may be able to hang a cord across the room and fix the microphone to it with tape or string. Tape the extension lead along the cord and down the wall so it does not move about.



If there is nowhere to attach a cord, tape the microphone to a long cane or a fishing rod. If you fasten the microphone to the line, you can raise and lower it to the right height.

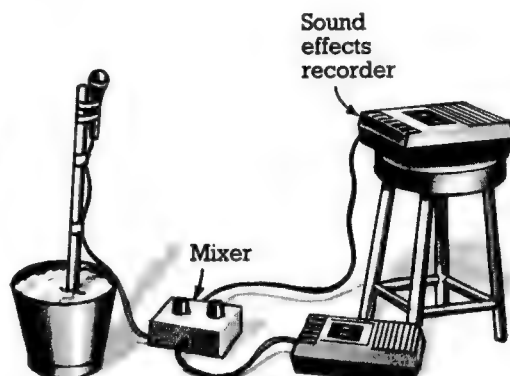


# Mixing recordings

These two pages give hints on mixing pre-recorded sound effects or music with another recording. You will need two recorders, one to play the sound effects tapes and one to make the main recording. If the music or sound effects are on record, you can record straight from a record player.



The simplest way to incorporate sound effects is to play them in the background so they are recorded on to the master tape through the microphone. You will need to do some tests and position the sound effects recorder, or record player, so that there is a good balance between background noises and speech.



A more professional way to incorporate sound effects is to use a mixer. On pages 40-45 you can find out how to make a simple mixer which will combine sounds from two separate sources (e.g. a microphone and a second recorder or record player), so they are recorded simultaneously.

## Preparing the sound effects

For your first attempt just use introductory music and perhaps two or three sound effects. Plan the recording (e.g. a programme or play) carefully in advance, marking in the script where each effect comes and how long it lasts. Check you have a long enough recording of each sound. If the effects are on separate tapes or records, put them in order, with a note of which side the sounds are on and where on the side. You could have a "sounds person" to operate all the effects.

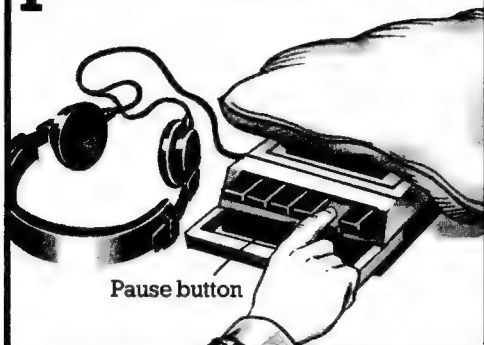


During the recording you will need to get each effect ready on the second recorder or record player so you can bring it in at the right moment. This is called cueing up (see opposite page).

Cueing up has to be done silently so it does not disturb the master recording.

Cover the second recorder with a cushion to muffle the clicks of buttons. If you need to listen to an effects tape or record to find the right place, use headphones, or play it extremely quietly so the sound is not picked up by the microphone.

## 1 How to cue up tapes



Use the tape counter, or listen through headphones, to find the sound you want. Stop the tape with the Pause button about a second before the sound starts.

## 2

Adjust volume if necessary

Release Pause

Move cushion aside

Unplug the headphones (if necessary). If you are using a mixer, plug it in. Then, at the right moment\*, move the cushion away and release the Pause button to play the sound effect.

## 1 How to cue up records



To cue up a track on a record, put the needle on the record and turn the record with your hand until you hear the track start. Then move the record a quarter-turn back. Now, when you switch on, the turntable will speed up in time for the start of the track.

## 2

Listen through headphones, or turn volume very low.

Cueing up a sound in the middle of a track is trickier. One way is to play the record and lift off the needle just before the sound begins. You will need to practise this as it is difficult to put the needle back down on exactly the same spot.

## Ideas for plays with sound effects



A simple event such as a train journey can make a good play. Build a story round the actors and use lots of sound effects, e.g. the rhythm of the train, whistles, doors banging, porters shouting.



Try recording space noises (there are some ideas on page 29) and produce a play about UFOs or a friendly Martian who lands by accident on Earth.

\*The producer should give a signal.



# Microphones, leads and plugs

Choosing a microphone and leads and plugs to fit your equipment can be very confusing because of the wide variety available. Here are some hints and pictures to help you.

Microphone leads are only about a metre long, so for most recordings you will need an extension lead. You can buy a ready-made extension lead or have one made up in an electrical shop. However, if you have a soldering iron you can make extension leads and connecting leads (for recording direct from a radio, record player or second recorder) yourself, as described opposite.



## Buying a microphone

Directional microphones pick up sounds mainly from the front. They are best for recording interviews, music and wildlife because they help to cut out background noises. Omni-directional microphones pick up sounds all round and are good for recording plays and groups of people or instruments. This type is the best to get for an all-purpose microphone.

The best quality microphones are "electret condenser" microphones, but they are expensive. "Dynamic" microphones are cheaper and are good enough for most recorders. When you buy a microphone take your recorder to the shop to check that the microphone works properly and has the right plug for your recorder. If not, buy an adaptor plug. Check, too, that the microphone will work with an extension lead.

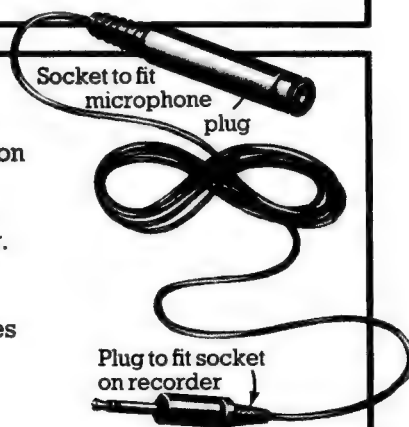
## How to make a microphone more directional



To make an omni-directional microphone more directional make a small cone of stiff paper and fix it with sticky tape to the microphone, as shown on the left. This will help cut out sound coming from the sides or behind.

## Extension leads

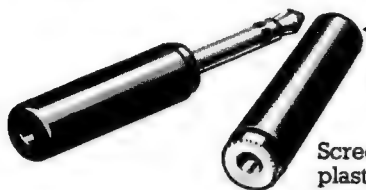
It is best to buy a straight, rather than a coiled, extension lead. A six-metre lead is long enough for most recordings. If you know where you will be using the lead, use string to measure the distance it has to cover. When you buy the lead, take your recorder and microphone to the shop so you can check that the microphone works with the extension lead. Sometimes microphones will not work with a very long lead because of electrical impedance which stops the electrical sound signals flowing.



## Making leads

To make up leads yourself you need a special kind of electrical wire called screened, or co-ax, cable. This is designed to carry electrical sound signals from mono equipment. You can buy the cable, and plugs and sockets to fit your equipment, from electronics components shops or send off for them to an electronics components supplier. To find the name and address of a supplier look in an electronics hobby magazine.

Over the page you can find out how to wire the plugs and sockets to the cable to make leads.



For an extension lead you need about six metres of cable and a socket and plug. For a connecting lead you need a metre of cable and two plugs.

Screened cable has a core of stranded wire covered in plastic, surrounded by another layer of stranded wire called the screen and an outer plastic case. The screen stops outside interference affecting the sound signals on the core wire. It also acts as an earth.

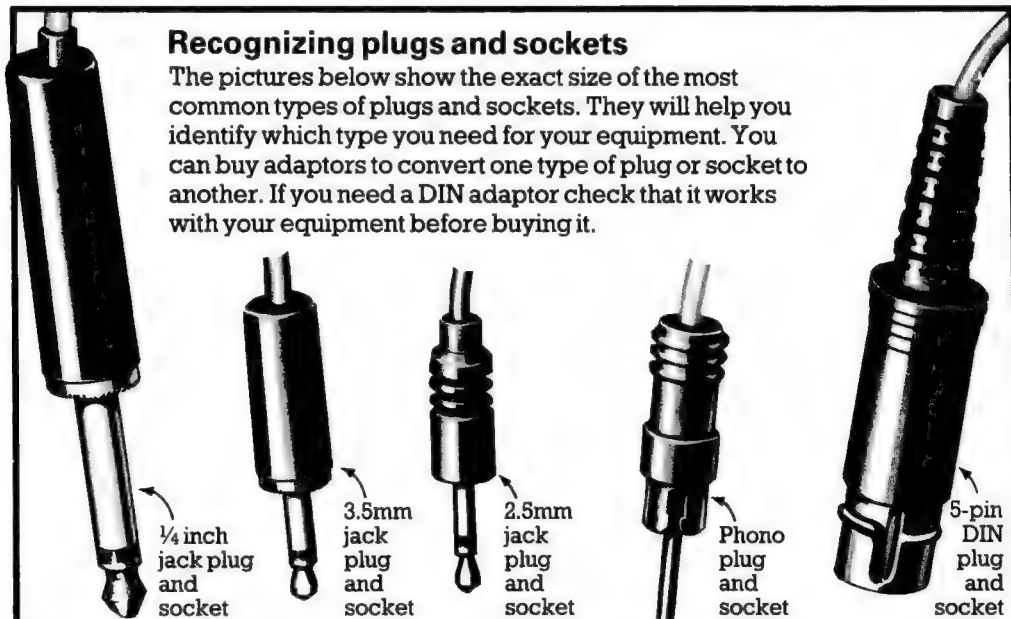
## Leads for stereo equipment

Lots of radios, record players and recorders are stereo. This means they have two speakers and the sound they produce is divided into two sets of sound signals which flow along separate wires (called the left and right channels). Plugs for stereo equipment have separate connections for the left and right channels.

If you want to connect your recorder to stereo equipment you need to make a lead with a stereo plug at one end. You can find out how to wire a stereo plug to mono cable over the page.

## Recognizing plugs and sockets

The pictures below show the exact size of the most common types of plugs and sockets. They will help you identify which type you need for your equipment. You can buy adaptors to convert one type of plug or socket to another. If you need a DIN adaptor check that it works with your equipment before buying it.

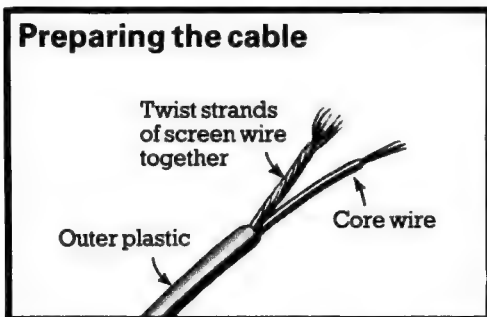




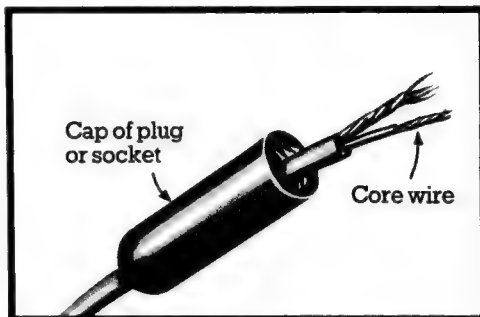
# Fitting plugs and sockets

On these two pages you can find out how to wire jack and DIN plugs and sockets to make leads. You need to solder the wires to fix them firmly to the terminals. There are instructions for soldering on page 41. If you have no soldering iron you can twist the wires into position on mono jack plugs and sockets, but the connections will not be very good and may not last long.

## Preparing the cable

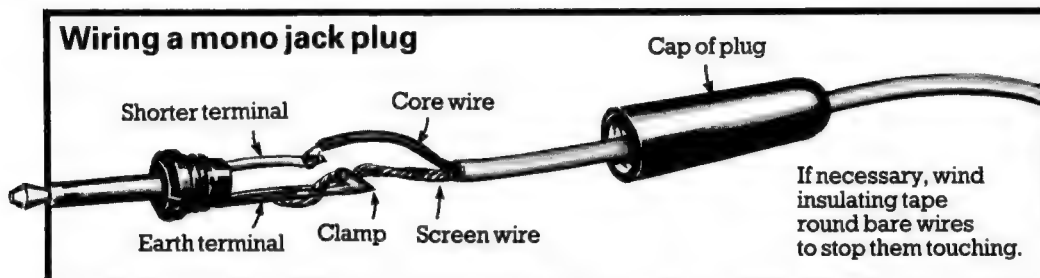


Use scissors or wire strippers to strip 1.5cm of the outer plastic from each end of the cable. Separate the strands of the screen wire from the core wire. Then strip about 5mm of the plastic from the core wire.



Twist together the strands of the core wire (and tin\* them if you are soldering the connections). Remember to thread the cap from the plug or socket on to the cable before starting to wire it.

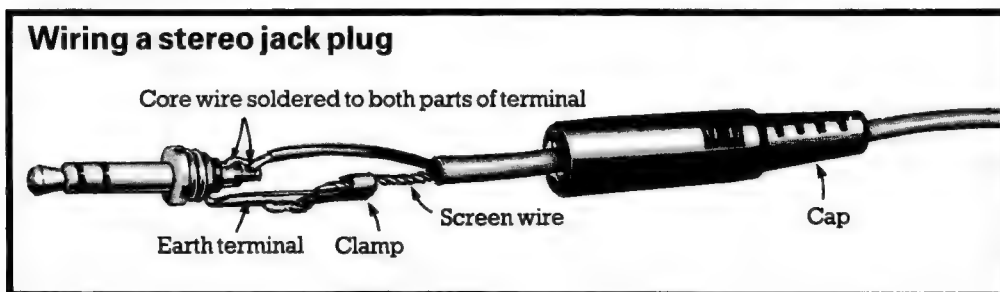
## Wiring a mono jack plug



Loop or solder the core wire to the shorter terminal of the plug and the screen wire to the longer terminal (this is the earth terminal).

The earth terminal has a clamp which you can bend down with pliers to hold the wires in position. This stops the connections coming apart.

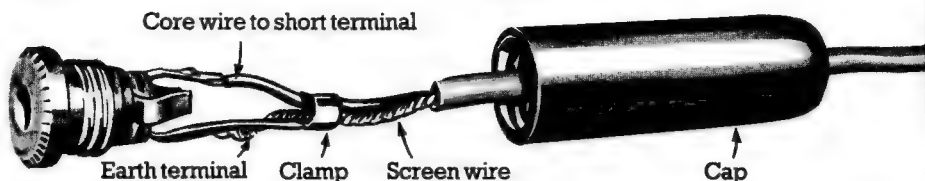
## Wiring a stereo jack plug



On a stereo plug the shorter terminal is divided into two parts by a piece of plastic. To fit a stereo plug to mono cable

you need to solder the core wire to both parts of the shorter terminal, and the screen wire to the earth terminal.

## Wiring a jack socket



A jack socket looks like this. The screen wire should be fixed to the long, earth terminal and the core wire to the short

terminal opposite. If the socket is stereo, remember to solder the core wire to both parts of the short terminal.

## Wiring a DIN plug and socket

A five-pin DIN plug has five terminals inside, one for each pin. These are numbered as shown on the right. Below you can see how to connect mono cable to the terminals.

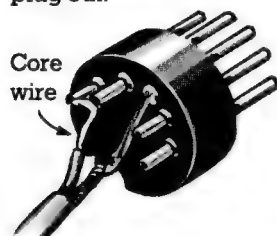
DIN plugs and sockets can be wired in two different ways. A plug must be wired in the same way as the socket it fits. You cannot tell which way this is by looking at the socket, so you have to do it by trial and error as described below.



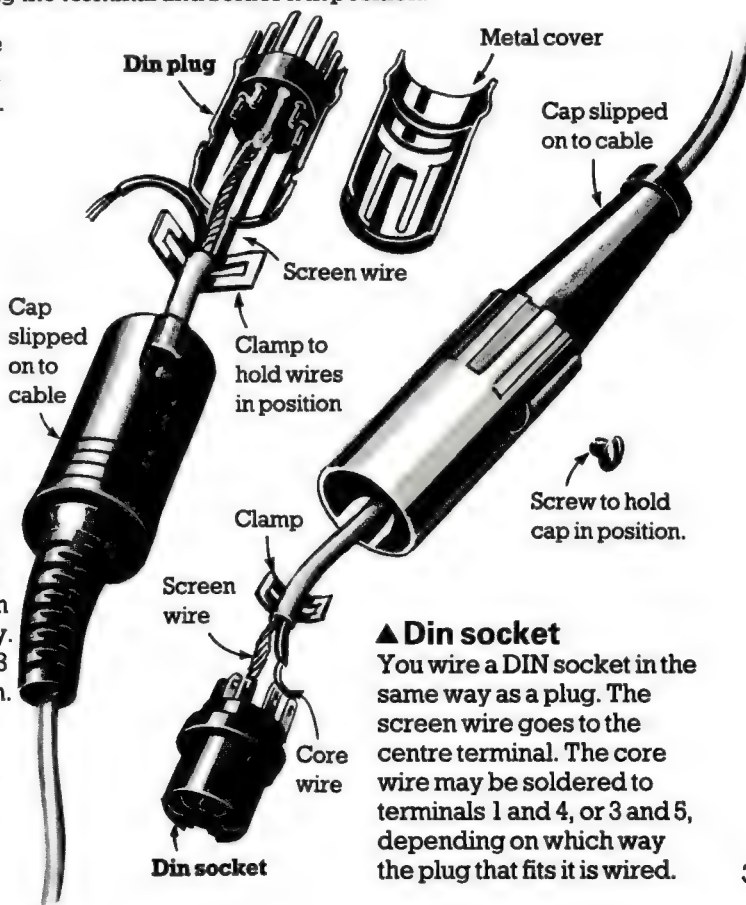
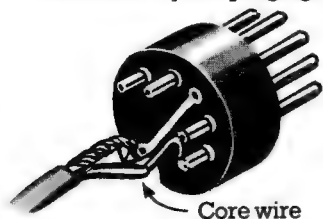
### Din plug

1. The screen wire goes to the centre terminal, 2. (This is the earth terminal.) Lay the wire along the terminal and solder it in position.

2. The core wire should be soldered to terminals 1 and 4 or 3 and 5. First try 1 and 4. Lay the wire across both terminals and solder it to each in turn. Then fit the metal cover and cap back into position and try the plug out.



3. If it does not work, melt the joints at terminals 1 and 4 with the hot soldering iron and pull the core wire away. Then solder it to terminals 3 and 5 and try the plug again.



### ▲ Din socket

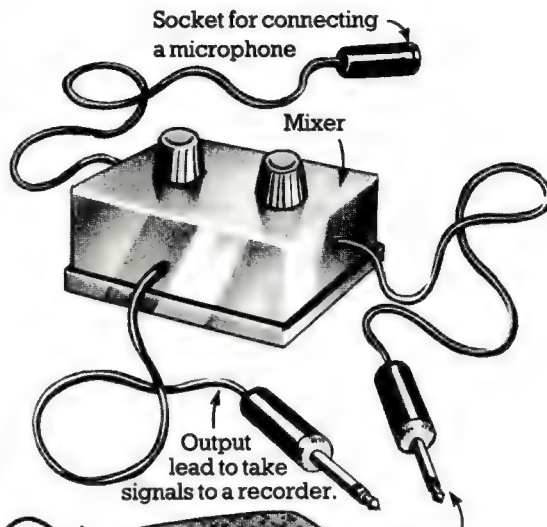
You wire a DIN socket in the same way as a plug. The screen wire goes to the centre terminal. The core wire may be soldered to terminals 1 and 4, or 3 and 5, depending on which way the plug that fits it is wired.



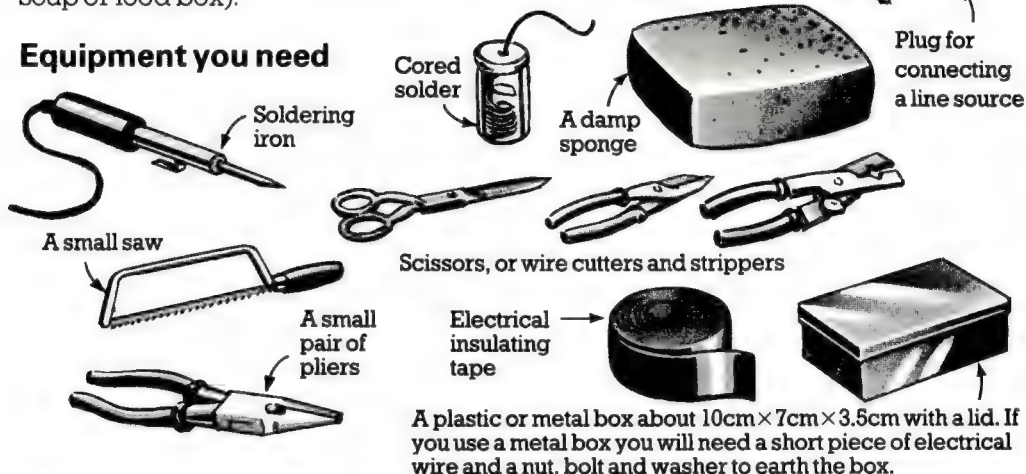
# A simple mixer to make

A mixer is an electronic device which enables you to record sound signals from two sources at the same time, e.g. from a microphone and from a second recorder (or radio or record player). The recorder, radio or record player is called a line source.

On the next few pages you can find out how to make a simple mixer. You need some electronic components, soldering equipment and a box to put the mixer in. It works best in a metal box, such as a tobacco tin, but you will need to drill holes in the tin. If you have no drill you can use a plastic box (e.g. a soap or food box).



## Equipment you need



## Components to buy

Components are available from electronics components shops or you can send off to an electronics supplier. Look for the name of a supplier in an electronics hobby magazine.

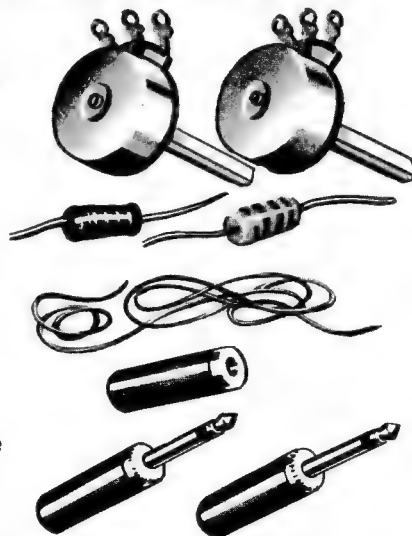
Two variable resistors (also called potentiometers or "pots" for short) with knobs to fit, one of 470K lin and one of 10K lin. The numbers show the strength of the pots, and lin is the type.

Two ½ watt resistors, one of 470K and one of 1K.

Three metres of mono screened, or co-ax, cable. This is a special kind of electrical wire used with recording equipment (see page 37).

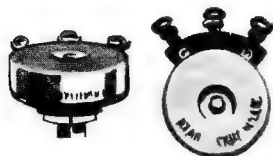
A socket to fit the plug on your microphone.\*

Two plugs, one to fit the headphones socket on your line source (e.g. radio) and one to fit the microphone socket on your recorder.\*

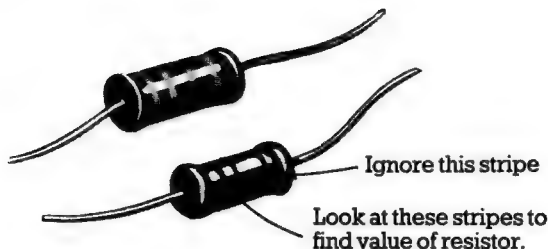


\*There are pictures to help you identify plugs and sockets on page 37.

## Sorting out components



The pots are easy to identify. They have their values (470K or 10K) written either underneath or round the side.

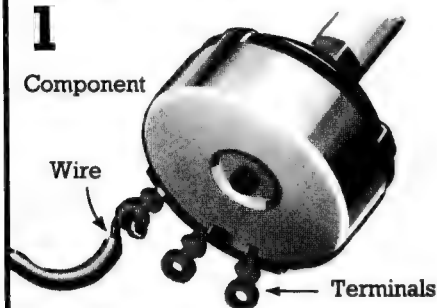


The value of the resistors is shown by the group of three coloured stripes at one end. To identify a resistor hold it with the three stripes on the left and read the colours from left to right. The 470K resistor has yellow, purple, yellow and the 1K resistor brown, black, red stripes.

## How to solder

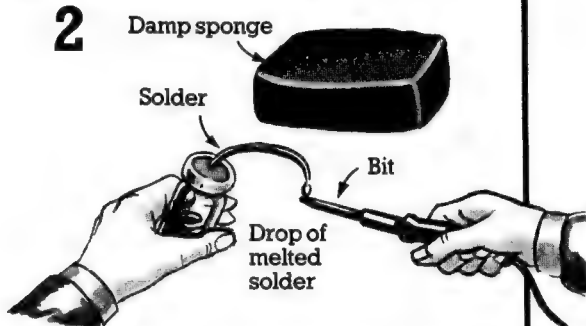
Soldering is a way of joining wires with melted metal to make a firm joint through which electrical signals can flow. You need a soldering iron, "cored" solder and a damp sponge. When the soldering iron is plugged in, the end part, called the bit, gets very hot so prop it up carefully and take care not to burn yourself.

1



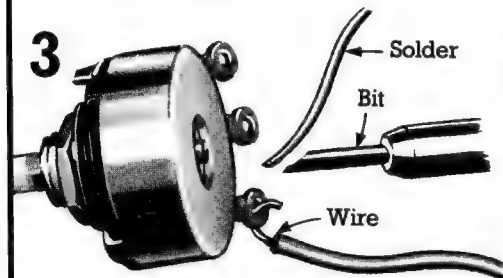
To solder a wire to a component, loop or twist the wire round one of the component's terminals, or rest the two surfaces to be soldered together so they are touching.

2



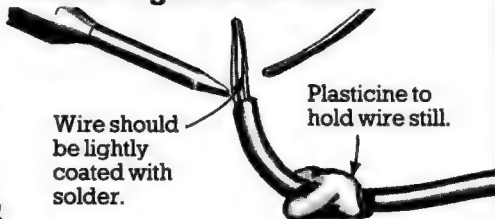
Plug in the soldering iron and, when the bit is hot, wipe it on the damp sponge to clean it. Then "wet" the bit by touching it with the solder so a drop of melted solder clings to it.

3



Put both the tip of the solder and the bit of the iron on to the joint. Leave them there for a second until a blob of solder joins the wire and component. Then let the joint cool for a few seconds.

## Soldering stranded wire

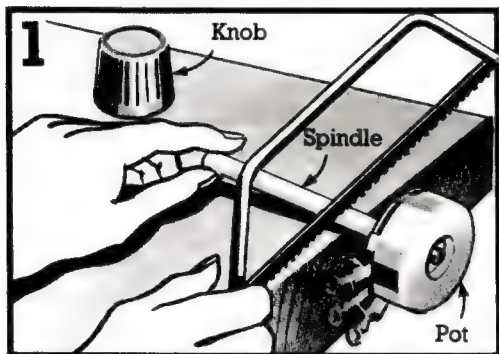
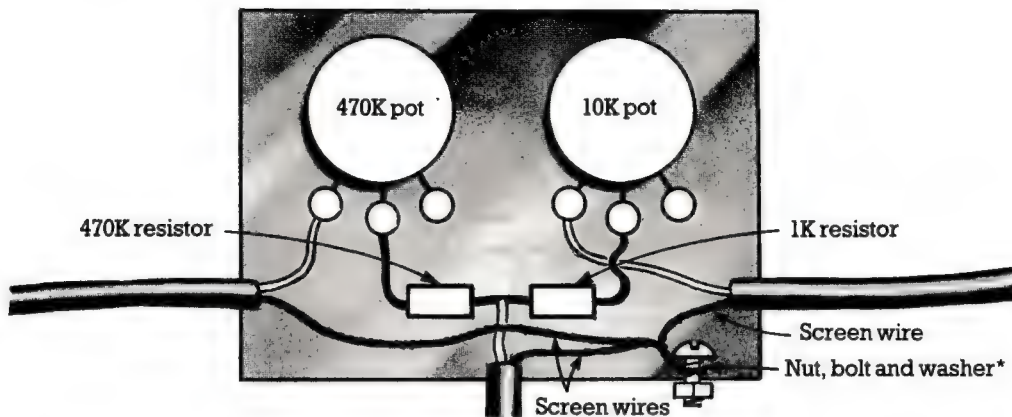


If you use stranded wire you need to "tin" it, that is, cover it with solder to hold the strands together. Twist the strands together, then wet the soldering iron and quickly stroke the wire with the bit and solder.

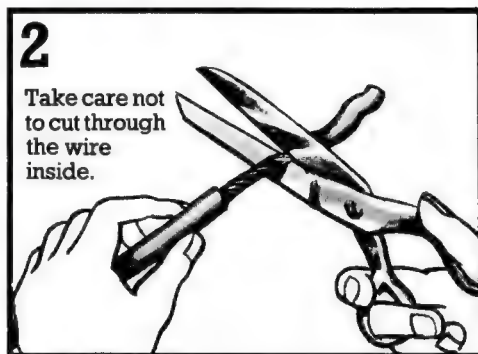


## Making the mixer

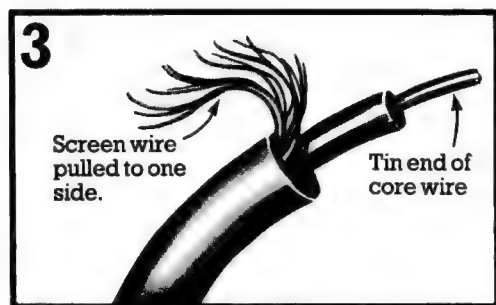
This diagram of the mixer shows how all the components and wires should be connected. You can refer to it as you build yours to make sure you connect all the components correctly.



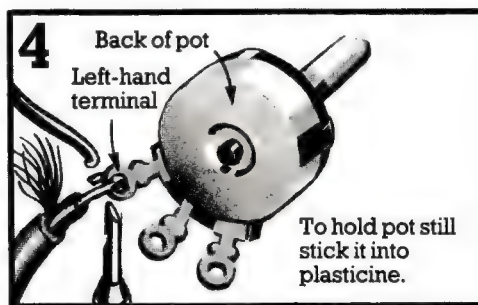
1 Cut the spindles of the pots with a small saw so they are slightly longer than the knobs which fit them. (If you do not have a saw you can leave the spindles as they are.)



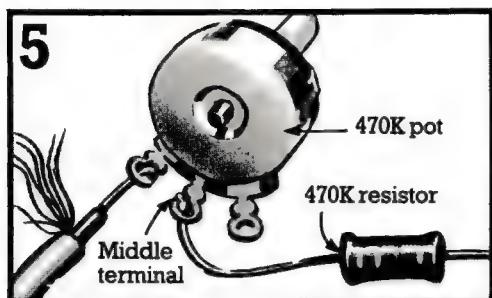
2 Take care not to cut through the wire inside.  
Cut the electric wire into three one-metre lengths to make the leads. Strip 5cm of the outer plastic off one end of each lead, using a pair of scissors or wire strippers.



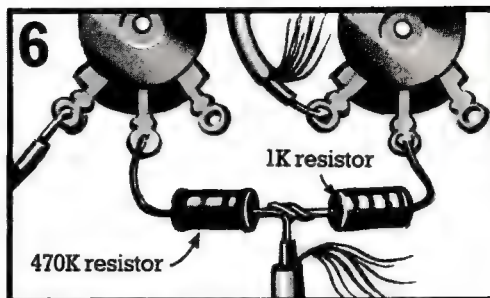
3 On each lead, separate the screen wires from the core wire and strip about 5mm of the plastic off the core wire. Then tin the core wire of each lead.



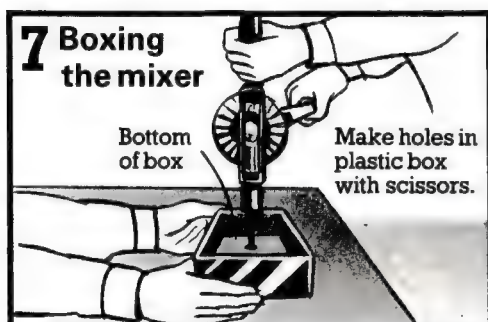
4 Solder the core wire of one of the leads to the left-hand terminal of one of the pots, as shown. Solder the core wire of another lead to the left-hand terminal of the other pot.



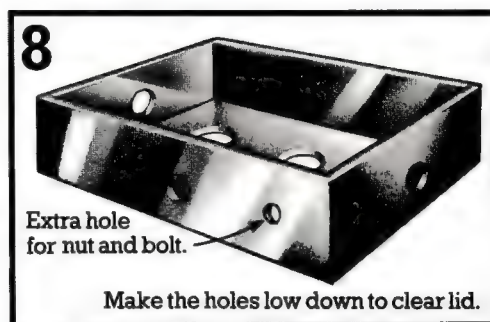
Find the 470K resistor (see page 41) and solder it to the middle terminal of the 470K pot. Solder the 1K resistor to the middle terminal of the 10K pot.



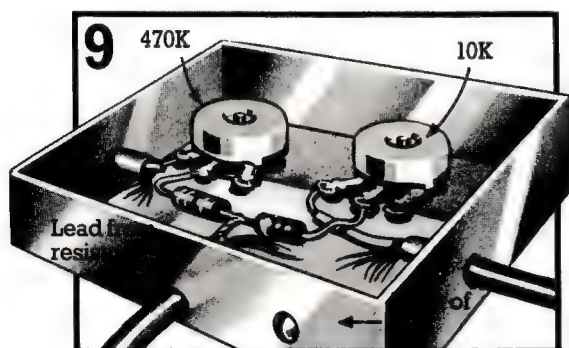
Twist the other ends of the resistors together and solder the core wire of the third lead to them, so the three are joined together.



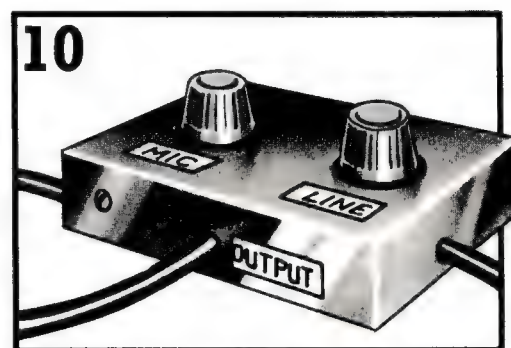
Make two holes in the bottom of the box, large enough to push the screws at the base of the spindles through. If you use a metal box, rest it on a piece of wood to drill the holes.



Now make three more holes to thread the leads through, one in each side of the box and one at the front. If it is a metal box make an extra hole in the front to fit the nut and bolt.

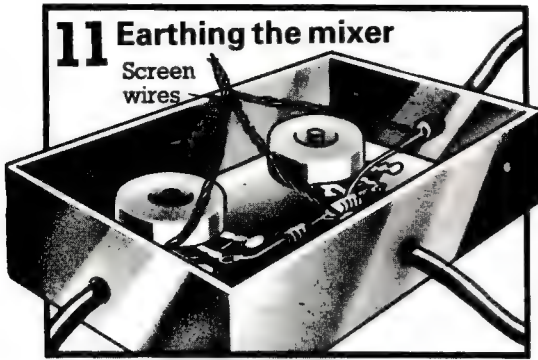


Unscrew the nuts and washers from the pots and push the spindles through the holes in the bottom of the box. Thread each lead out through the nearest hole. The lead from the two resistors should come out at the front.



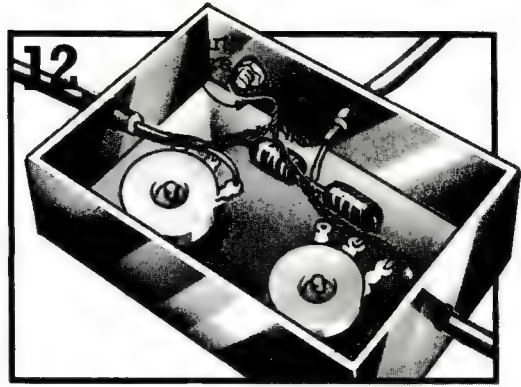
Turn the box upside down and replace the washers and nuts to hold the pots in position. Fit the knobs on to the spindles and label the 10K pot Mic and the 470K pot Line. Label the lead at the front of the box Output.





**11 Earthing the mixer**

When everything is in position, twist together the three loose screen wires and join them with solder. This is to earth the mixer, otherwise it will only produce a loud hum.

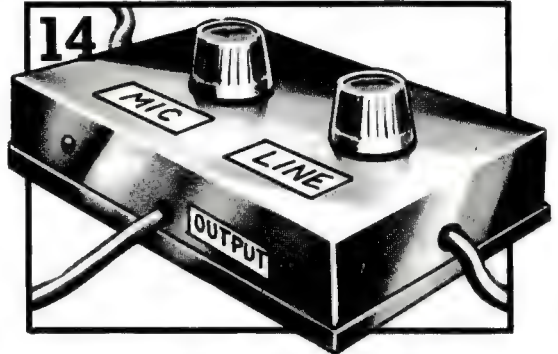


If you are using a metal box, bolt the screen wires to the extra hole at the front of the box. If the screen wires are not long enough to reach the hole, solder a short length of electric wire to them.



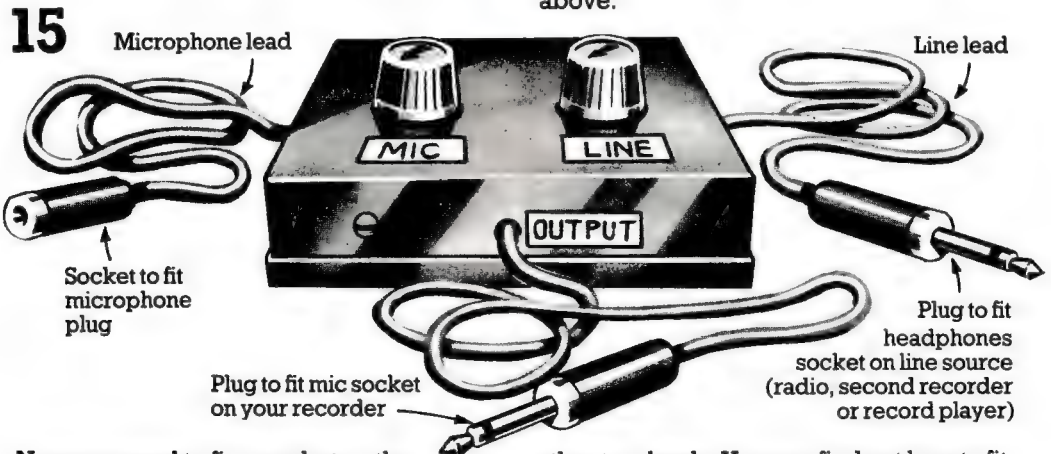
**13**

Finally, wind insulating tape round all the bare wires inside the box so there is no danger of them touching and causing a short circuit. Then put the lid on the box.



**14**

Stick circles of sticky-back paper on the top of each knob. Then turn the knobs as far as possible anti-clockwise and draw an arrow on the top of each, as shown above.



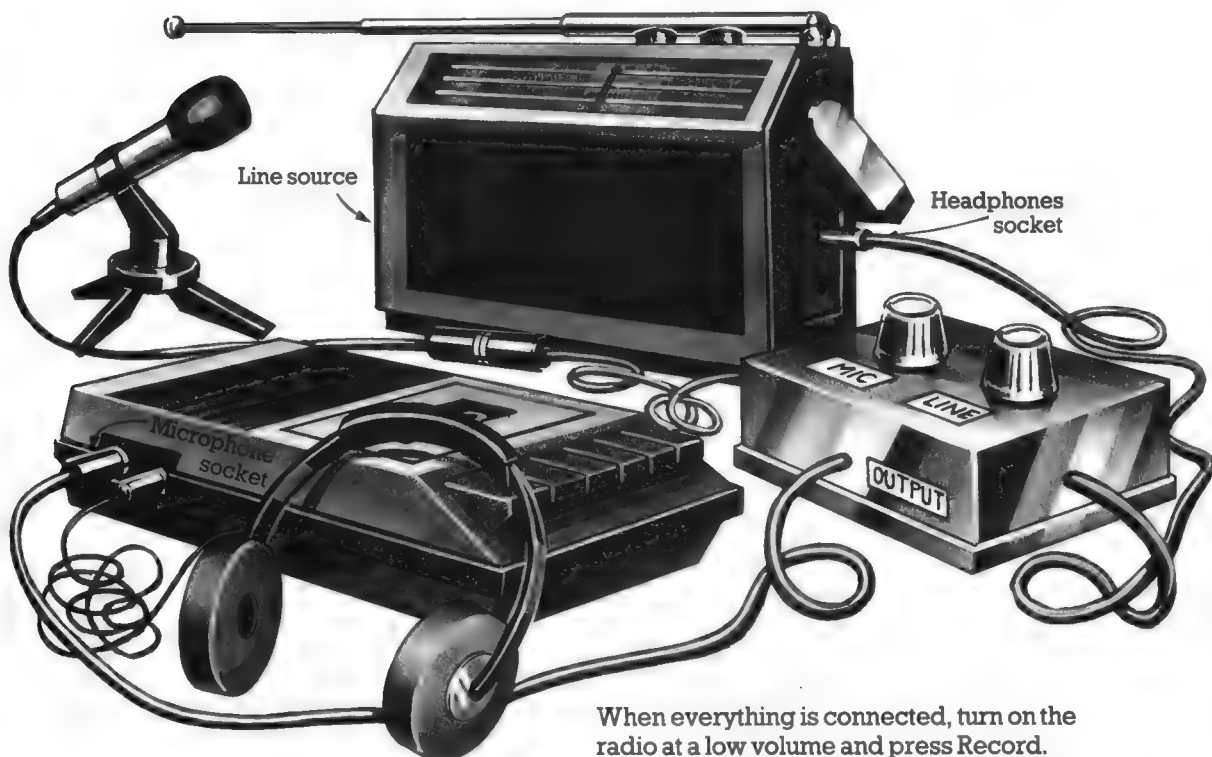
**15**

Now you need to fix a socket on the microphone lead and plugs on the

other two leads. You can find out how to fit plugs and sockets on pages 38-39.

## Testing the mixer

To connect up the mixer, first plug the output lead into the microphone socket of your recorder. Connect the microphone lead of the mixer to a microphone and plug the line lead into the headphones socket of the line source. (In this picture the line source is a radio.) Now you can record from the microphone and radio at the same time and use the line and mic knobs on the mixer to control the amount of sound from each source.



In order to balance the sounds from each source as you make a recording, plug an earpiece or headphones into the recorder so you can listen in. If you do not have an earpiece or headphones, you will need to make several test recordings, setting the line and mic knobs at different levels each time. Make a note of the levels for each test, then play them back and decide which levels are best.

When everything is connected, turn on the radio at a low volume and press Record. Now as you turn the line knob on the mixer the sound from the radio should go louder and quieter. (If it does not see below.) Turn the line knob right down and try out the microphone. Speak into the microphone and turn the mic knob to reduce or increase the volume of your voice.

It is a good idea to label the mixer to show the maximum and minimum volume for each knob.

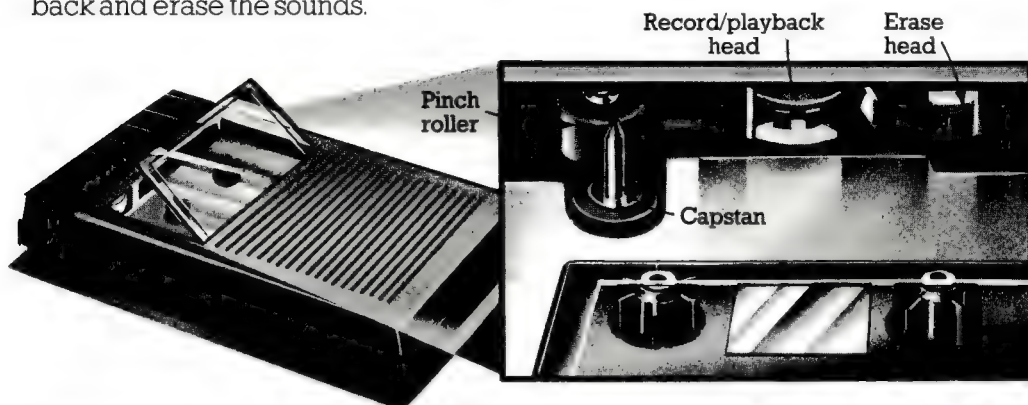
### Hints for using the mixer

On this mixer you can never completely fade out the line source. Turning up the mic knob will make the line source sound a bit quieter. If it is still too loud, try lowering the volume of the line source (e.g. the radio) itself. You may find you always need to use the volume control of the line source, as well as the line knob on the mixer, to get the right balance between microphone and line channels.



# Looking after your equipment

It is important to keep your recorder and tapes clean and in good condition, especially the heads of the recorder. These are the parts which record, play back and erase the sounds.



You can buy a head-cleaning tape to clean the heads, capstan and pinch roller. You play this like an ordinary cassette, but do not use it too often as it tends to wear out the heads. Another way to clean the heads is to wipe them carefully with cotton wool and methylated spirits.\*

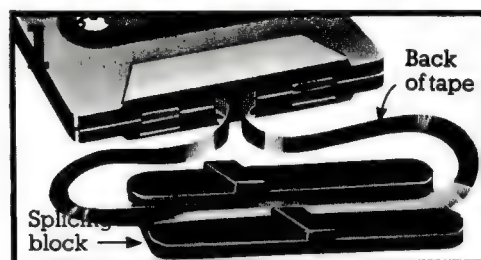
You should dust inside the recorder occasionally with a clean dry brush and

wipe the outside with methylated spirits and a soft cloth.

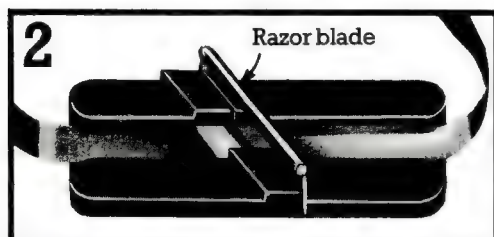
Keep the recorder and tapes in a cool dry place. It is a good idea to run tapes through the recorder at least once a year so the layers of tape do not stick together. Run them on Fast Forward or Rewind as these do not wind the tape so tightly as Play or Record.

## Mending tapes

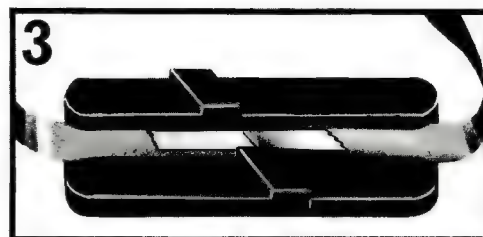
Cassette tape is very thin and awkward to mend but it can be done if you are careful. You need a razor blade, and a splicing block and splicing tape which you can buy from hi-fi shops. If the broken ends of the tape are lost inside the cassette you will have to open the case. Some cases have screws so you can take them apart quite easily. Otherwise you will have to break the seal round the edge with a razor blade and carefully transfer the spools of tape to a replacement case. (You can buy these from hi-fi shops too.)



Lay the broken ends of the tape on the splicing block with the back of the tape facing up. Cut off any badly damaged tape and overlap the ends by about 1cm. Take care not to touch the coated side of the tape.



With a razor blade, cut through both pieces of tape using the diagonal groove in the splicing block as a guide. Remove the loose bits of tape.



Butt the diagonal ends of the tape together and stick splicing tape over the join. Do not use ordinary sticky tape.

\*If the heads are constantly getting clogged up with bits of coating from the tape, try using better quality tapes.

# Cassette words

**AC socket** Socket for connecting the recorder to the mains electricity supply.

**Audio equipment** Any electrical equipment which reproduces sound through speakers or headphones, e.g. a radio, record player or recorder.

**Aux in (auxiliary input) socket** Socket on recorder for recording direct from another piece of audio equipment (also called Line-in).

**Cassette deck** A cassette recorder which has a separate amplifier and speakers.

**Chrome tape** High quality cassette tape with a chromic oxide coating. It is also called Type II tape.

**Cue/review** Mechanism on some recorders which enables you to press Play and Fast Forward or Rewind at the same time, so you can listen to a tape as it is winding.

**DC socket** Socket for connecting a recorder to a non-mains power source, for instance, to the car battery via the lighter socket in a car.

**DIN plug or socket** Used for connecting audio equipment. A DIN plug usually has five pins and a DIN socket, five holes.

**Directional microphone** Microphone which picks up sounds coming mainly from in front of it.

**Ferrichrome tape** Type of tape with an iron oxide and chromic oxide coating (also called Type III tape). It is best when used on a recorder with a tape selector switch.

**Ferric tape** Most common and cheapest type of tape (also called Type I or normal tape). It has an iron oxide coating and is suitable for all recorders.

**Heads** The parts in a recorder which record the sounds on the tape, play them back and also erase them. Most simple recorders have one head for recording and playing back and another for erasing.

**Input** The sound signal going into the recorder.

**Jack** Type of plug with a single pin. There are three sizes of jack plugs and sockets: 2.5mm, 3.5mm and ¼ inch.

**Leader** A short length of plastic tape at the beginning of a cassette tape. You cannot record on the leader tape.

**Level control** Device on some recorders for controlling the amount of sound being recorded on the tape.

**Level indicator** Gauge on some recorders to show how much sound is being recorded on the tape.

**Line-in socket** Socket on recorder for recording direct from another piece of audio equipment (also called Aux in).

**Metal tape** Best quality type of tape (also called Type IV tape). It has a pure iron coating, but can only be used on recorders with a tape selector switch to adapt them for metal tape.

**Mini-jack** 3.5mm jack plug or socket.

**Mono** Word used to describe audio equipment which can handle only one set of sound signals, or channel.

**Omni-directional microphone** Microphone which picks up sounds from all directions.

**Output** The sound signal produced by a recorder or other piece of audio equipment.

**Phono** Type of plug with a single pin surrounded by a metal collar.

**Pseudo-chrome tape** A Type II tape which has an iron oxide and cobalt oxide coating, instead of a chromic oxide one.

**Rec/PB (Record/playback) socket** Socket on a recorder for either recording direct from another piece of audio equipment, or playing a tape back through a separate amplifier and speakers.

**Source** Any piece of audio equipment (e.g. a microphone or a record player) from which you are recording.

**Stereo** Word used to describe audio equipment which can handle two sets of sound signals (called the left and right channels).

**Superferric tape** A slightly better quality type of ferric tape.

**Tape (or cassette) out socket** Socket on audio equipment for recording direct on to a recorder.

**Tape selector switch** Switch on more expensive recorders which adapts the machine so it can handle several different types of tape.



# Index

- AC socket, 47
- adaptor, 36, 37
- Aux in socket, 5, 12, 47
- birdsong, hints for recording, 23
- brass instruments, hints for recording, 32
- built-in microphone, 2, 4, 5, 8, 15
- candid recordings, 17
- capstan, 46
- cassette,
  - deck, 3, 47
  - recorders, 2-3, 4-5
  - socket, 14
  - tape, 6-7, 8, 47,
    - how to mend, 46
- chime (sound effect), 20
- choir, how to record, 33
- chrome tape, 6, 47
- crackles, on recording, 9
- creaking door (sound effect), 20
- cue/review, 10, 47
- cue up, how to, 34, 35
- cues, how to give, 30
- DC socket, 47
- DIN, plug and socket, 12, 37
- how to wire, 39
- directional microphone, 22, 29, 32, 36
- earpiece, 5, 13, 23, 24
- socket on radio, 12, 13
- earth
  - for mixer, 44
  - for plugs and sockets, 38, 39
- echoes, on recordings, 10, 26, 32
- eject button, 4
- erase head, 46
- fast forward button, 4, 11, 46
- ferrichrome tape, 6, 47
- ferric tape, 6, 47
- fire (sound effect), 18
- footsteps (sound effect), 19
- guillotine (sound effect), 18
- guitar, hints for recording, 32
- gunshot (sound effect), 18
- head cleaning tape, 46
- headphones, 13, 14, 22, 23, 24, 34, 35, 45
  - socket, 5, 14, 45
- heads, 46, 47
- hiss, on recordings, 9, 16
- hum, on recordings, 9, 44
- indicator light, 5
- input, 47
- jack, plugs and sockets, 12, 37, 47
  - how to wire, 38-39
- leader, on tape, 8, 47
- leads,
  - connecting, 12, 14, 15, 36, 37
  - extension, 16, 17, 18, 22, 25, 33, 36, 37
  - how to make, 36, 37
  - microphone, 17, 36
- line in socket, 5, 12, 13, 14
- line
  - signals, 12
  - source, 12, 13, 40, 44, 45, 47
- level control,
  - automatic, 8, 13
  - manual, 8, 9, 22, 47
  - level indicator, 8, 9
- listening in to recordings, 13, 14, 22, 24, 30, 45
- mains input socket, 5
- metal tape, 6, 47
- microphone
  - built-in, 2, 4, 5, 8, 15
  - crackles, 17
  - directional, 22, 29, 36, 47
  - dynamic, 36
  - electret condenser, 36
  - hints for buying, 36
  - omni-directional, 22, 29, 36, 47
  - rifle, 24
  - separate, 16-17
  - signals, 12
  - socket, 5, 12, 13, 45
- mini-jack, 47
- mixer, 14, 34, 40-45
- mono,
  - definition of, 47
  - recorders, 2, 4-5, 37
- music,
  - home-made, 9
  - how to record, 32-33
  - how to mix with other recordings, 34-35
- newsreader, 31
- night-time recordings, 25
- omni-directional microphone, 29, 32, 36, 47
- orchestra, how to record, 33
- output, 47
  - sockets, 12, 14
- parabolic reflector, 23
- pause button, 5, 9, 11, 15, 24, 29
- percussion instruments, hints for recording, 32
- personal portable recorder, 2
- pets, how to record, 17
- phono, plug and socket, 37
- piano, how to record, 33
- pinch roller, 46
- play button, 4, 8
- plugs,
  - how to wire, 38-39
  - on connecting leads, 12
  - on microphones, 16
  - types of, 37
- power supply, 5
- presenter, 30
- pressure pad, 6
- producer, 30
- pseudo-chrome tape, 47
- radio cassette recorder, 3, 5
  - how to record from, 12
- radio,
  - how to record from, 12-13, 34, 40, 45
  - socket, 12
- rain (sound effect), 20
- record button, 4, 8
- recording level, see level control
- record/playback
  - head, 46
  - socket, 5, 12, 13, 14
- record player, how to record from, 14, 34-35, 40
- rec/PB, see record/playback
- socket
  - rec out socket, 14
- remote
  - socket on recorder, 5, 16
  - switch on microphone, 16
- rewind button, 4, 11
- rifle microphone, 24
- sockets, 5, 37
  - how to wire, 38-39
- solder, how to, 41
- soldering iron, 36, 40, 41
- sound signals, 9, 12, 40
- source, 47
  - line, 12, 13, 40, 45
  - microphone, 40, 45
- stereo,
  - definition of, 47
  - recorders, 2
  - plugs and sockets, 37, 38, 39
- stop button, 4, 8
- superferric tape, 47
- tabs, 7, 8
- tape, see cassette tape
- tape counter, 5, 11, 35
- tape out socket, 12, 13, 14
- television, 12
- thunder (sound effect), 15
- tin, how to, 41
- tone control, 4
- umbrella, as sound reflector, 23, 24
- waves (sound effect), 19
- wind (sound effect), 20
- windshield, 22, 23, 28
- woodwind instruments, how to record, 32
- zoos, recording at, 25

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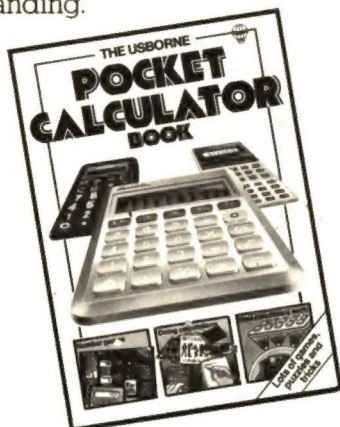
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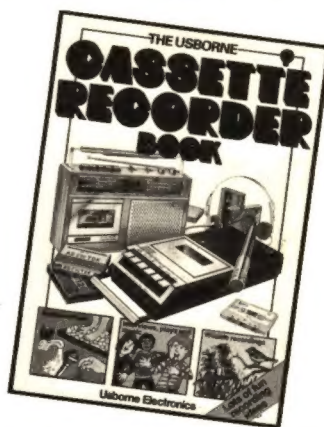
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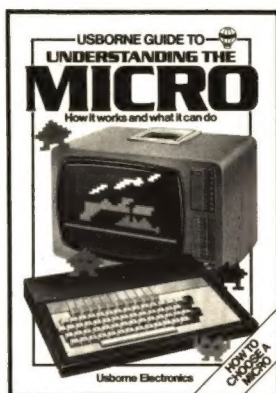
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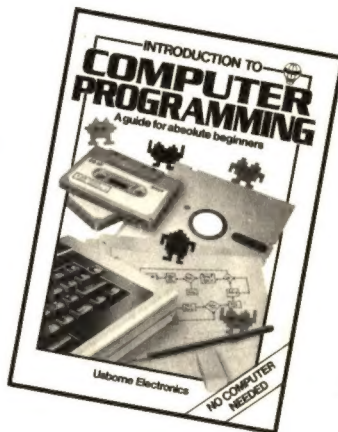
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